

OUTLINE OF STATEMENT OF WORK

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1. INTRODUCTION

Martin Marietta Energy Systems, Inc. (hereafter referred to as the Company) is currently under contract to the Department of Energy (DOE) to operate the Oak Ridge Gaseous Diffusion Plant (ORGDP), the Oak Ridge National Laboratory (ORNL), the Y-12 Plant in Oak Ridge, Tennessee, the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, and the Portsmouth Gaseous Diffusion Plant (PORTS) in Portsmouth, Ohio. ORGDP, with part of its facilities now in standby, has been involved in uranium enrichment and associated support functions; the ORNL is a broad-based research facility that is also involved in reactor operations and isotope generation; the Y-12 Plant is primarily dedicated to production of parts for weapons systems from uranium. The PGDP, located near Paducah, Kentucky, carries out uranium enrichment and associated support functions. The PORTS facility, located near Portsmouth, Ohio, also carries out uranium enrichment and associated support functions.

As part of this responsibility, the Company must ensure that an environmental monitoring program is in place to provide a thorough and systematic ongoing assessment that is fully responsive to the needs for maintaining and enhancing compliance with state and federal regulations. The monitoring program provides a yardstick for measuring progress in implementing improved environmental management practices and in taking remedial action to correct deficiencies in past practices. Also, the program provides for continuing, regular verification of compliance with applicable state and federal permits and regulations.

Environmental management departments at each of the five installations listed are responsible for implementing effective environmental monitoring programs both on-site and off-site. Over the past two decades, these programs have evolved to meet the ever-changing environmental climate. The Environmental and Safety Activities organization has the responsibility to assist each of the five installations and interface with DOE to develop uniform and consistent guidance related to environmental monitoring activities. A Coordinator of Environmental Protection Activities has been appointed within this organization to develop policies and oversee the implementation of well-defined and consistent environmental protection programs at each installation. Also, this position serves as the project manager responsible for preparing and submitting to DOE the annual Environmental Surveillance Reports for the five Energy Systems installations. These reports must reflect the results of comprehensive, year-round programs to monitor the impact of operations. The completion of work described in this document will lead to improvements in the environmental monitoring programs and thus improve the quality of these programs at each installation.

The environmental protection program policies are summarized below and should be used by the Seller during the conduct of the assessment to determine whether the Company is fulfilling its responsibilities from an overall systems approach.

It is the policy of Martin Marietta Energy Systems, Inc., as a contractor of DOE to conduct all operations in a manner that not only ensures protection of our workers but also the public and the environment. To this end, applicable federal (including DOE), state, and local environmental protection goals will be incorporated into the formulation and implementation of all new programs and in the remediation of existing environmental concerns resulting from past practices.

Accordingly, Energy Systems is committed to following both the letter and the spirit of all statutes, regulations, standards, and orders with the ultimate objective of anticipating and addressing

all potential environmental concerns before they pose a threat to the quality of the environment or the public welfare.

We shall objectively communicate our environmental status to the government, the regulators, and the public. Furthermore, it is the policy of Energy Systems to have all environmental protection efforts carried out consistently and cooperatively among the five installations operated for DOE.

The responsibility for ensuring implementation of good environmental practices is a line organization function, with the individual installation managers having primary accountability. The overall program oversight and coordination responsibility, including formulating company policies and interfacing with DOE and the appropriate regulatory agencies, lies with the Environmental and Safety Activities organization.

Consistent with this policy, the Environmental and Safety Activities organization is requesting assistance from the private sector in conducting an assessment of the Energy Systems ambient environmental monitoring program at all five installations. The results of this assessment will provide basis for improving future environmental monitoring activities and for modifying sampling systems.

The Seller shall carry out the assessment as described in this Statement of Work (SOW), and shall report the recommendations in the form of three formal reports to the Company. The Seller shall be responsible to the Environmental and Safety Activities organization for the assessment. The Company will then use the results of the assessments to coordinate changes in the existing monitoring programs.

2. OBJECTIVES

The objective of this task is to review the ambient environmental monitoring programs at the five Department of Energy installations operated by the Company for compliance and consistency with DOE and Energy Systems policies and strategies, DOE Orders, environmental laws and regulations, and the current best monitoring practices.

The scope of the assessment shall include the ambient air, water, groundwater, biological, and radiological environmental monitoring performed near plant perimeter fences, in receiving streams, and at off-site locations. The scope of this task does not include assessing the on-site point source emission monitoring associated with specific stack sampling locations. It does not include specific National Pollutant Discharge Elimination System (NPDES) water monitoring and biological monitoring locations, nor does it include on-site groundwater monitoring locations.

The scope of the assessment shall include the ambient air monitoring programs at each site and off-site; the surface water monitoring programs; and the off-site programs associated with the sampling of fish, wildlife, milk, groundwater, soil, vegetation, and stream sediments. Both radiological and nonradiological parameters should be reviewed and evaluated. The current monitoring locations should be evaluated to ensure that they are the appropriate locations to provide usable and defensible data. The current monitoring locations to be evaluated at each site are shown in the tables included in this SOW. Also, the current parameters and sampling frequencies must be evaluated for adequacy. The tables outline the current ambient monitoring programs at each installation.

The Company has a number of requirements that should be satisfied as a result of the conduct of this assessment:

1. The Seller shall determine if the Company is currently operating environmental monitoring programs that measure the appropriate parameters, at the appropriate frequencies, and in the appropriate locations to comply with the stated policies.
2. The Seller shall, based on the findings of the first requirement, recommend improvements to the current environmental monitoring programs. These recommendations shall include the areas of sampling frequency, siting locations, adequacy of parameters, and adequacy of current sampling equipment. In addition, recommendations regarding the adequacy of field sampling procedures and field calibration procedures shall be included.
3. The Seller shall make these recommendations using statistically valid sample designs.

3. TASK DESCRIPTION

3.1 SCOPE OF WORK AND SELLER'S RESPONSIBILITIES

The Seller shall conduct a review of the ambient environmental monitoring programs at ORNL, ORGDP, the Y-12 Plant, PGDP, and PORTS. During the course of the task, the Seller's representatives shall visit and review each installation's environmental monitoring programs and determine the adequacy of the current programs to meet DOE's and the Company's policies and strategies, DOE Orders, environmental laws and regulations, and the current best monitoring practices. The Seller shall use the same team of reviewers in conducting these site assessments to achieve a consistent assessment at all five installations.

3.1.1 Organization into Ambient Monitoring Categories

To evaluate the Company's system for monitoring the environs of each site, the Seller shall use the following categories:

- ambient air monitoring programs
- surface water monitoring programs
- off-site groundwater monitoring programs
- vegetation, soil, and sediment sampling programs
- external gamma radiation monitoring programs
- biological monitoring programs, including wildlife (raccoon, deer, and waterfowl), vegetables and other garden products, livestock, and fish.

Ambient monitoring data for 1987 are presented using these categories in a four-volume document entitled *Environmental Surveillance Report*. The volume titles are

- *Environmental Surveillance of the U.S. Department of Energy Oak Ridge Reservation and Surrounding Environs During 1987* (ES/ESH-4/V1)
- *Environmental Surveillance of the U.S. Department of Energy Oak Ridge Reservation and Surrounding Environs During 1987* (ES/ESH-4/V2)
- *Environmental Surveillance of the U.S. Department of Energy Paducah Reservation and Surrounding Environs During 1987* (ES/ESH-4/V3)
- *Environmental Surveillance of the U.S. Department of Energy Portsmouth Gaseous Diffusion Plant and Surrounding Environs During 1987* (ES/ESH-4/V4; POEF-1180)

A copy of these volumes will be available to the Seller for reference purposes during the assessment period.

3.1.2 Assessing the Overall Completeness and Effectiveness of the Ambient Environmental Monitoring Programs

The Seller shall review the purpose or objective of each of the monitoring programs. Reviewing each program's objective will serve to define why the program is being conducted.

After the purpose of each monitoring program has been reviewed, this information should then be used to describe the data to be collected, the laboratory analysis to use, and how the data should be reported. The Seller shall make recommendations that include sampling frequencies, siting locations, parameters, and sampling equipment if different from those established. In addition, recommendations should be made regarding field sampling procedures and field calibration procedures. Where appropriate, the Seller shall recommend performance specifications and strategies to upgrade these programs to improve the reliability and quality of the data.

This assessment should not be considered as an audit of the environmental monitoring programs. In fact, audits have already been performed at several of these sites and recommendations have been made regarding the need for an overall assessment of the monitoring programs at each site. The Seller's task is to make this assessment and recommend specific actions that should be taken to meet the objectives associated with each monitoring program.

3.1.3 Seller's Assessment Report

The Seller shall issue three separate reports: a report for the Paducah Reservation, a report for the Portsmouth Reservation, and a report encompassing the Oak Ridge Reservation. These reports shall include the ambient environmental monitoring activities at all three plant installations.

The reports shall be in the following format:

- Executive Summary—description of general approach, brief description of objectives, and how the assessment was conducted, an overview of the recommendations with an indication of the relative importance (ranking) of each recommendation and rationale for proposed changes in the current programs.
- Section for each category—specific findings and recommendations for each site for each category as outlined in Sect. 3.1.1.
- Overall findings and recommendations to include but not be limited to a detailed description of the overall environmental monitoring program, problems identified and the impact/effects of the problems, and system deficiencies and recommended actions for improvement.

The Seller's report shall contain, at a minimum, the following information:

- An analysis of existing ambient environmental monitoring programs with respect to applicable DOE Orders, state, and federal regulatory requirements.
- According to the ambient monitoring categories outlined in Sect. 3.1.1, an overall assessment of the monitoring activities conducted at each of the installations should be included.
- According to the ambient monitoring categories outlined in Sect. 3.1.1, the Seller shall include recommendations for improvements where applicable. The reasons for these recommendations shall be described to provide the Company with a basis for further evaluation. To reduce overall monitoring costs, deletions to the current programs should be recommended where applicable. Recommendations should address the replacement or upgrading of existing monitoring equipment, the procedures for operating the equipment, the need for changes in current monitoring locations, the need for changes in sampling frequencies, and the need for changes in parameters being measured. Both radiological and nonradiological parameters shall be evaluated.

The Seller shall submit a draft document for review and approval by the Company prior to submission of the final document.

3.1.4 Designation of a Seller's Representative

The Seller shall designate a representative who shall interface with the Company in general, and with the Coordinator of Environmental Protection Activities in particular, before, during, and after the assessment as the Seller's official agent in all matters regarding the conducting and reporting of the assessment. These matters include, but are not limited to, scheduling of meetings and tours, review of company documents and records, contacts with company personnel, work arrangements (work time, delays), and data and information gathering during the assessment. The Seller shall not be endowed with the powers of regulatory auditors, and under no circumstances shall the Seller be permitted to harass or harangue company personnel. The Company reserves the right to review all schedules, agenda, and other mechanisms of interface with the Seller and to have the Company representative present during interactions between the Seller and Company personnel. The Seller shall not release any information gained during the review without the approval of the Company.

3.1.5 Security

The Seller's representatives must be United States citizens. All notifications and requests to enter Company facilities must be made at least two working days in advance of such visits and be made to the Coordinator of Environmental Protection Activities.

3.1.6 Health and Safety

The Seller's representatives are expected to abide by all applicable Health and Safety regulations while on site. Signs will be posted if bump hats, safety glasses, and/or hearing protection are required in a given area. If dosimeters are required for visiting a particular area, these will be supplied by the Company.

3.2 COMPANY'S RESPONSIBILITIES

The Company will provide access to its environmental monitoring program documents and records that are not protected by security restrictions. The Company will provide personnel associated with its environmental monitoring operations for discussions with the Seller as needed for the Seller to carry out the requirements set forth in this SOW.

The Company will designate a Company representative who will serve as the Company's agent in all matters regarding this assessment.

Table 1. Ambient air stations and meteorological monitoring stations operated by the Y-12 Plant

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
1-12 (Fig. 1)	Whatman 41 filter	Continuous	Quarterly	Uranium
1-11 (Fig. 1)	0.8- μ m Gelman GA-4	Continuous	Weekly	Fluoride
East and West (Fig. 1)	Whatman 41 filter	24-h sample every 6 days	Every 6 days	TSP ^a
East and West (Fig. 1)	Pumped ambient air	Continuous	Hourly	SO ₂
East and West (Fig. 2), MT5, MT6	Automated to Plant Shift Superintendent's office	Continuous	Continuous	Meteorological data ^b

^aTSP = total suspended particulates.

^bWind speed and direction, temperature, relative humidity, barometric pressure.

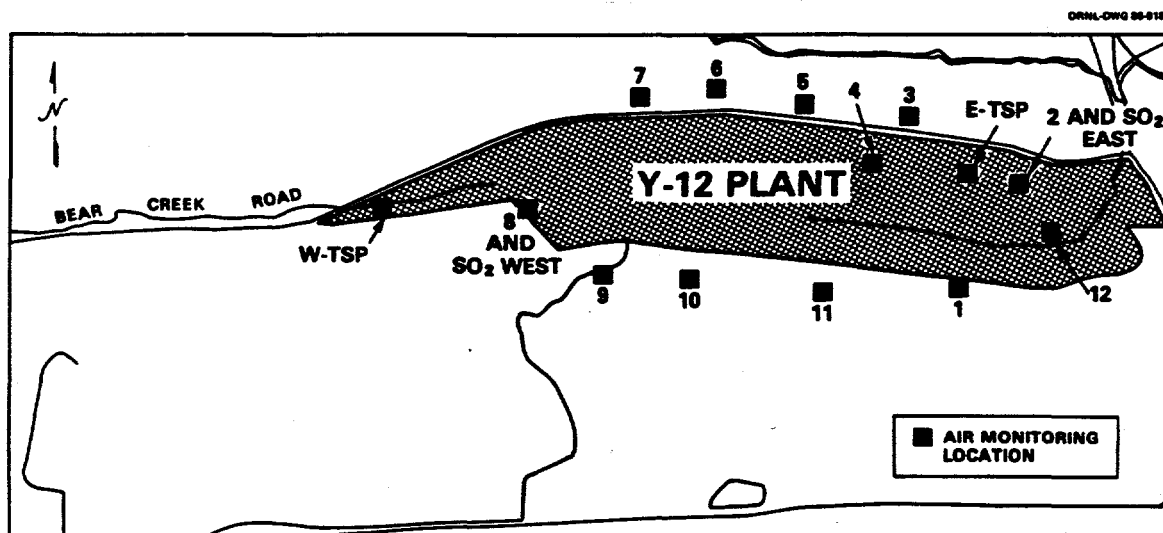


Fig. 1. Ambient air monitoring stations operated by the Y-12 Plant.

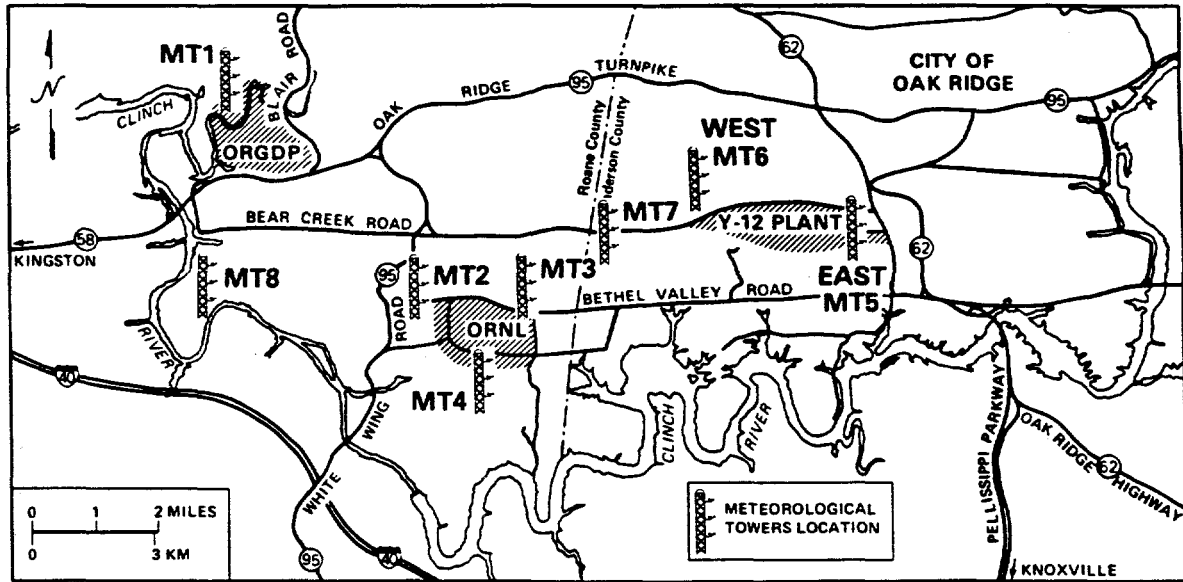


Fig. 2. ORR meteorological monitoring network.

**Table 2. Ambient air stations and meteorological monitoring stations
operated by ORGDP**

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
K-1, K-2, K-3, K-4, K-5 (Fig. 3)	24-h composite	Every 6th day	Weekly	TSP ^a , Pb, U, Cr, Ni
MT1 (Fig. 2)	Automated to Plant Shift Superintendent's office	Continuous	Continuous	Meteorological data ^b

^aTSP = total suspended particulates.

^b60-m tower. Data are collected at 10 m and 60 m. Information includes wind speed and direction, atmospheric stability data, temperature, and precipitation.

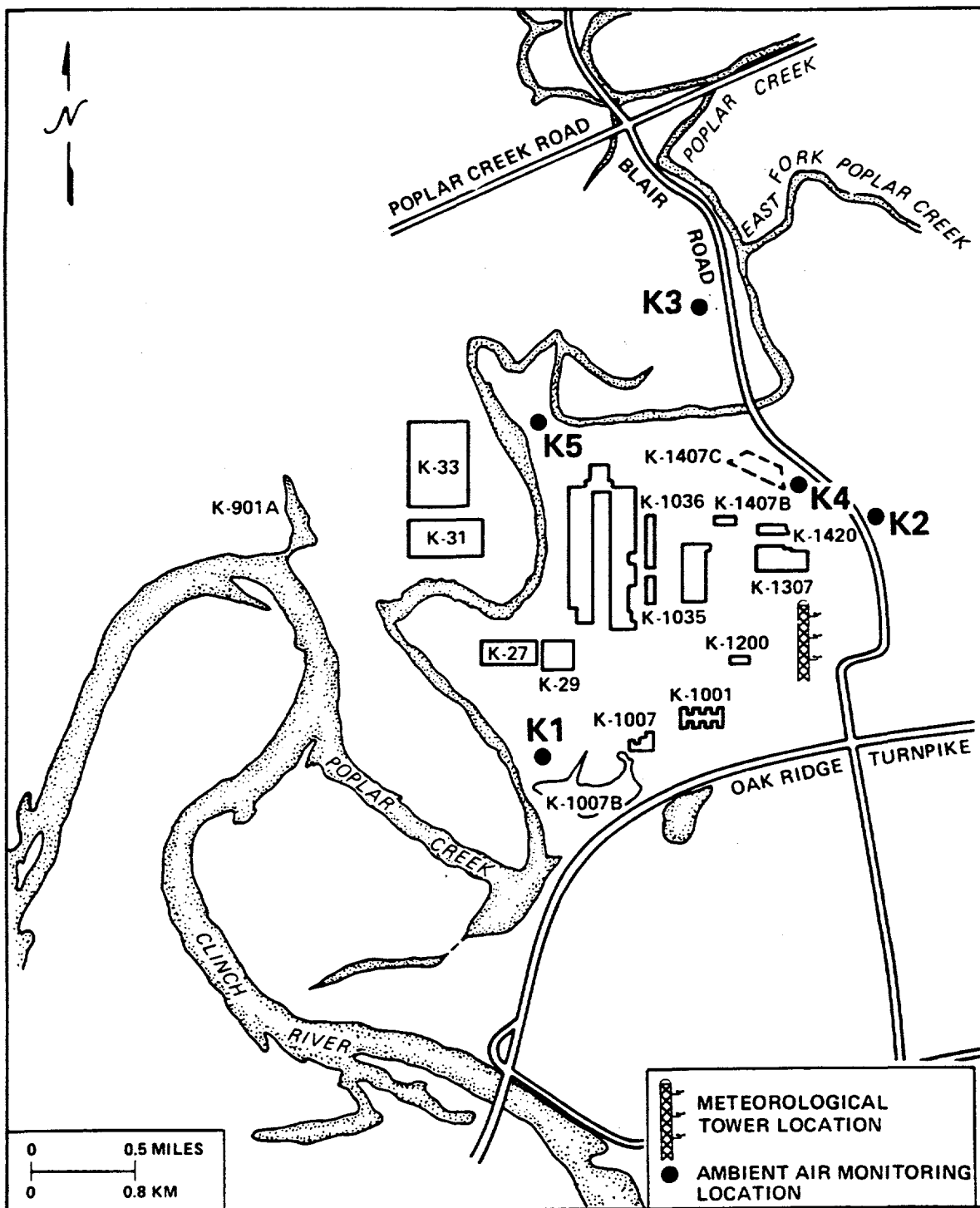


Fig. 3. Location of ORGDP ambient air monitors and meteorological tower.

Table 3. Ambient surface water at ORGDP

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
K-1770, K-1513, K-1710, K-716 (Fig. 4)	24-h composite	1/month	1/month	Fluoride, As, cyanide, Hg, nitrate-N, sulfate, ammonia-N, COD ^a , TDS ^b , TSS ^c , pH, U, Cd, Cr, Mn, Na, Ni, Pb, Zn, Cu
K-1770, K-1513, K-1710, K-716	Grab	1/week	1/month	Cs, Pu, Np, Tc
West Fork	Grab	1/month	1/month	Cs, Pu, Np, Tc
Brashaer Island, K-1770, K-1710, K-1513, K-716	Grab	1/quarter	1/quarter	Asbestos
West Fork, Brashaer Island (Fig. 4)	Grab	1/quarter	1/quarter	Fluoride, As, cyanide, Hg, nitrate-N, sulfate, ammonia-N, COD, TDS, TSS, pH, U, Cd, Cr, Mn, Na, Ni, Pb, Zn, Cu
K-1700	24-h composite	1/month	1/month	Fluoride, As, cyanide, Hg, nitrate-N, sulfate, ammonia-N, COD, TDS, TSS, pH, U, Cd, Cr, Mn, Na, Ni, Pb, Zn, Cu, gross alpha, gross beta. Isotopic scan if gross alpha or beta is elevated.
Mitchell Branch	Grab	1/quarter	1/quarter	Fluoride, As, cyanide, Hg, nitrate-N, sulfate, ammonia-N, COD, TDS, TSS, pH, U, Cd, Cr, Mn, Na, Ni, Pb, Zn, Cu, gross alpha, gross beta. Isotopic scan if gross alpha or beta is elevated.

^aCOD = chemical oxygen demand.^bTDS = total dissolved solids.^cTSS = total suspended solids.

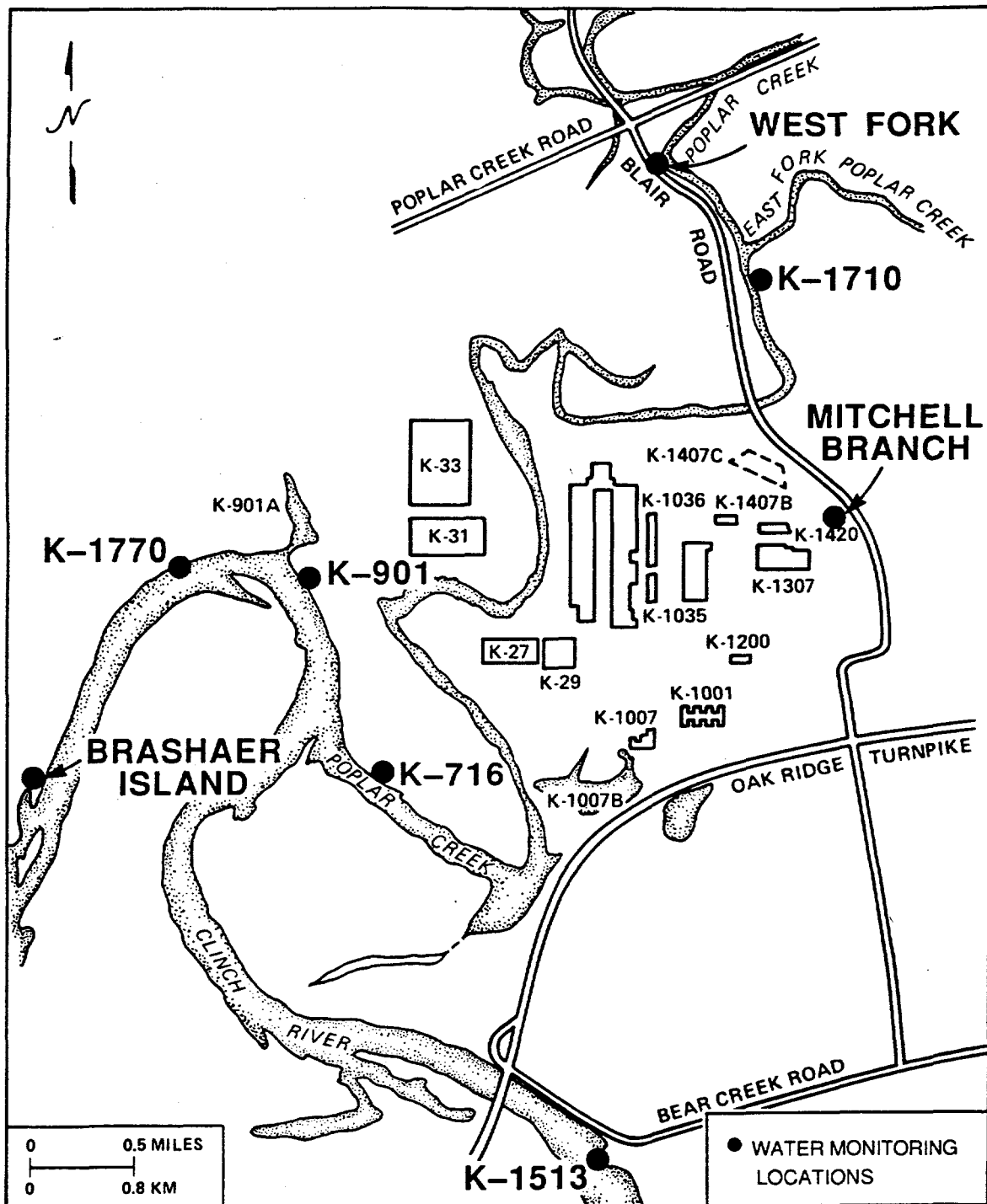


Fig. 4. ORGDP water monitoring locations.

Table 4. Soil and stream sediment monitoring at ORGDP

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
<i>Soil</i>				
S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30 (Fig. 5)	Semiannually	Semiannually	Semiannually	Fluoride, U
<i>Stream sediment</i>				
SS1, SS2, SS3, SS4, SS5, SS6, SS7 (Fig. 6)	Semiannually	Semiannually	Semiannually	Hg, Pb, Ni, Cu, Zn, Cr, Mn, Al, Th, Cd, U

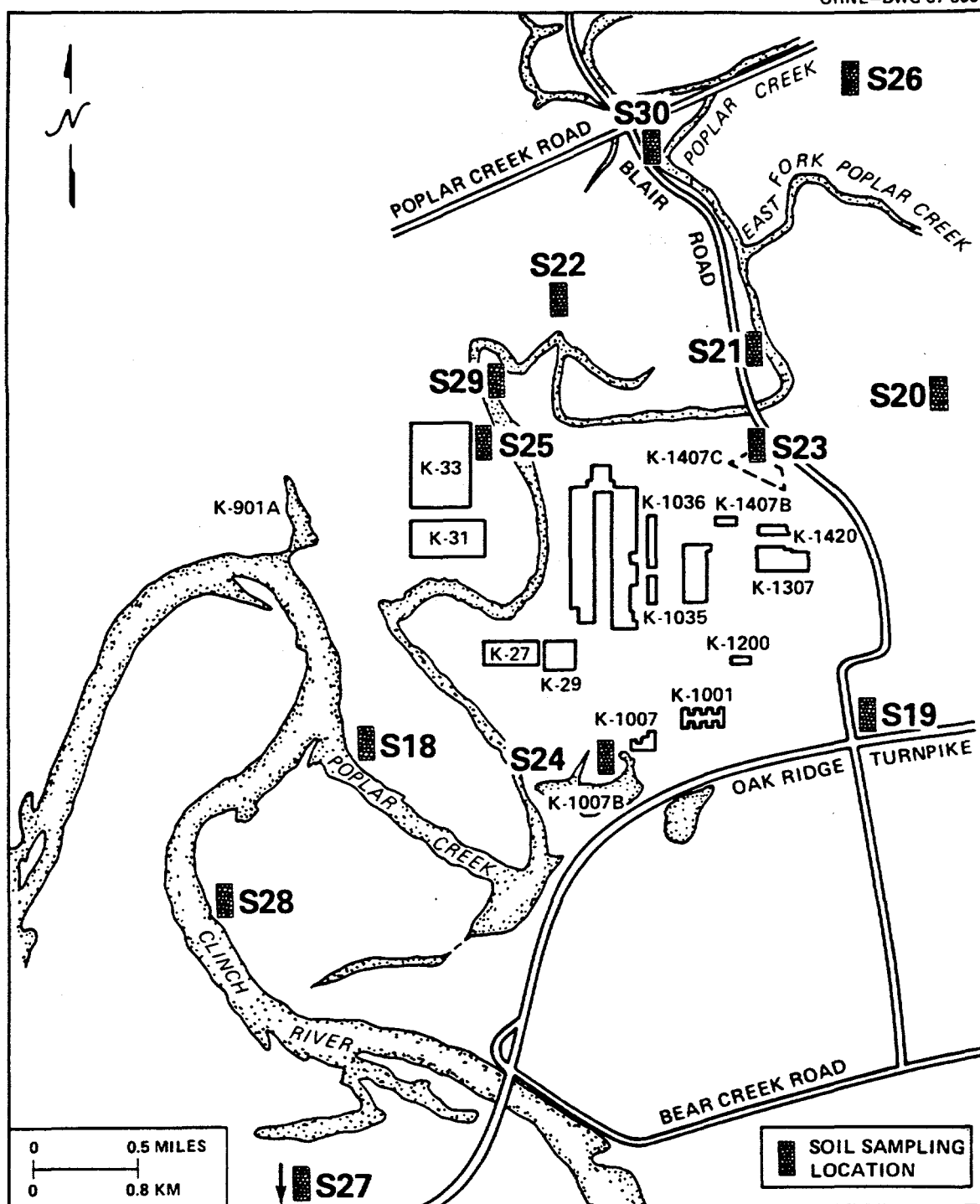


Fig. 5. Soil sampling locations around ORGDP.

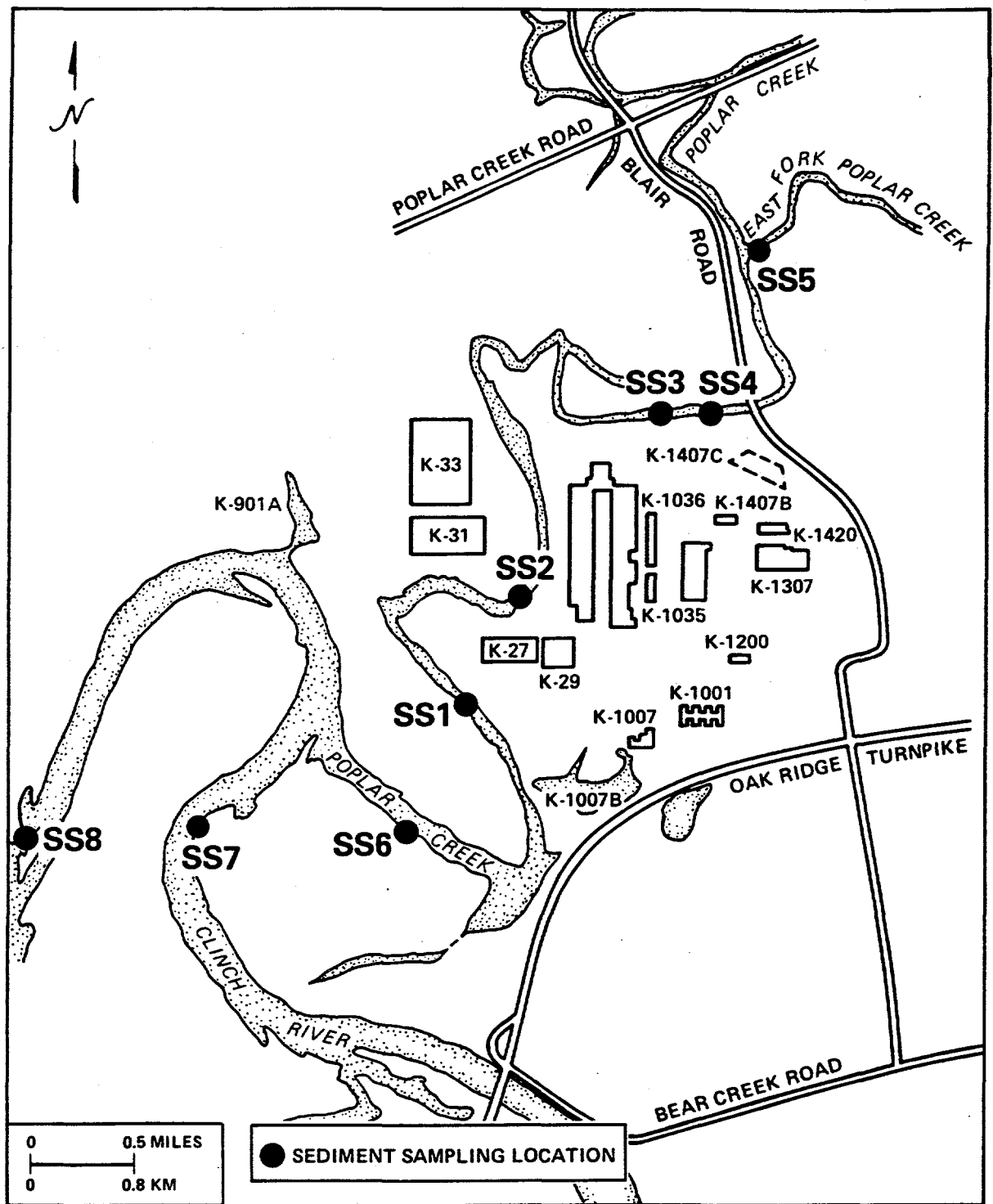


Fig. 6. Stream sediment sampling locations at ORGDP.

Table 5. Grass and pine needle monitoring at ORGDP

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
<i>Grass</i>				
V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13 (Fig. 7)	Semiannually	Semiannually	Semiannually	Fluoride, U, Tc
<i>Pine needles</i>				
PN1, PN2, PN3, PN4, PN5, PN6 (Fig. 7)	Semiannually	Semiannually	Semiannually	Fluoride, U, Tc

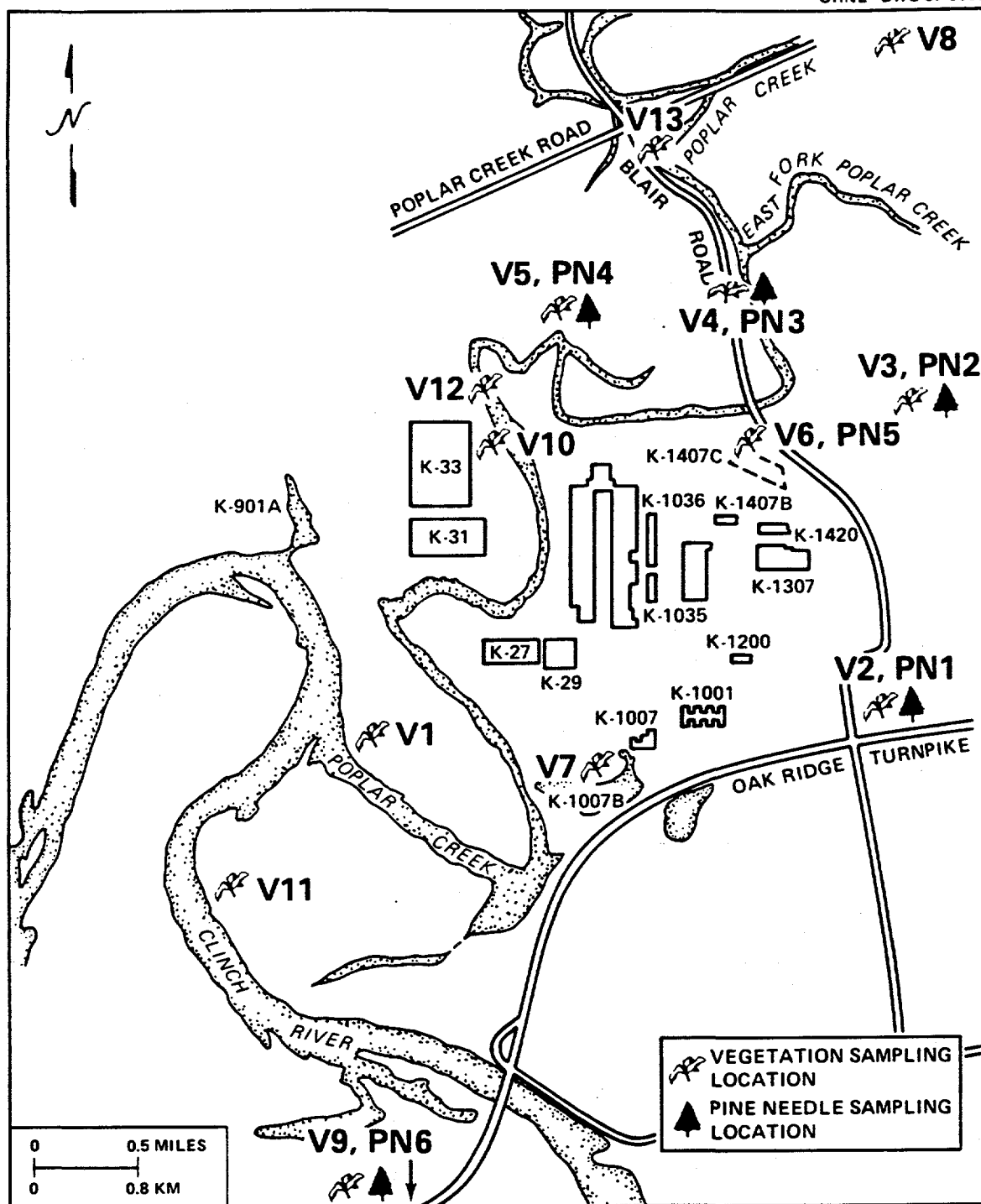


Fig. 7. Map of ORGDP pine needle and grass sampling locations.

Table 6. ORNL air monitoring stations (24 locations)

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
3, 7, 8, 9, 22, 23, 31, 33, 34, 36, 40, 41-46 (Fig. 8)	Continuous	Weekly	Weekly	^{131}I , gross alpha, gross beta
3, 8 (Fig. 8)	Continuous	Monthly	Monthly	^3H
LAM ^a , PAM ^b , RAM ^c (Fig. 9)	Continuous	Quarterly	Quarterly	^7Be , ^{60}Co , ^{137}Cs , ^{238}Pu , ^{239}Pu , ^{228}Th , ^{230}Th , ^{232}Th , Sr^d , ^{234}U , ^{235}U , ^{238}U
34, 36, 40, 41, 45, 46 (Fig. 8)	Continuous	Quarterly	Quarterly	^7Be , ^{60}Co , ^{137}Cs , ^{238}Pu , ^{239}Pu , ^{228}Th , ^{230}Th , ^{232}Th , Sr^d , ^{234}U , ^{235}U , ^{238}U
MT2 ^e (Fig. 2)	Continuous	Continuous	15 min, hourly	Meteorological data ^f
MT3 (Fig. 2)	Continuous	Continuous	15 min, hourly	Meteorological data ^g
MT4 (Fig. 2)	Continuous	Continuous	15 min, hourly	Meteorological data ^g

^aLocal air monitoring; composite of 3, 7, 9, and 22 (Fig. 8).

^bRemote air monitoring; composite of 8, 23, 31, 33, 42, 43, and 44 (Fig. 8).

^cPerimeter air monitoring; composite of 51, 52, and 53 and 55, 56, and 57 (Fig. 9).

^dTotal radioactive Sr (^{89}Sr + ^{90}Sr).

^eORNL designations: MT2 = C; MT3 = B; MT4 = A.

^f100-m tower.

^g30-m tower.

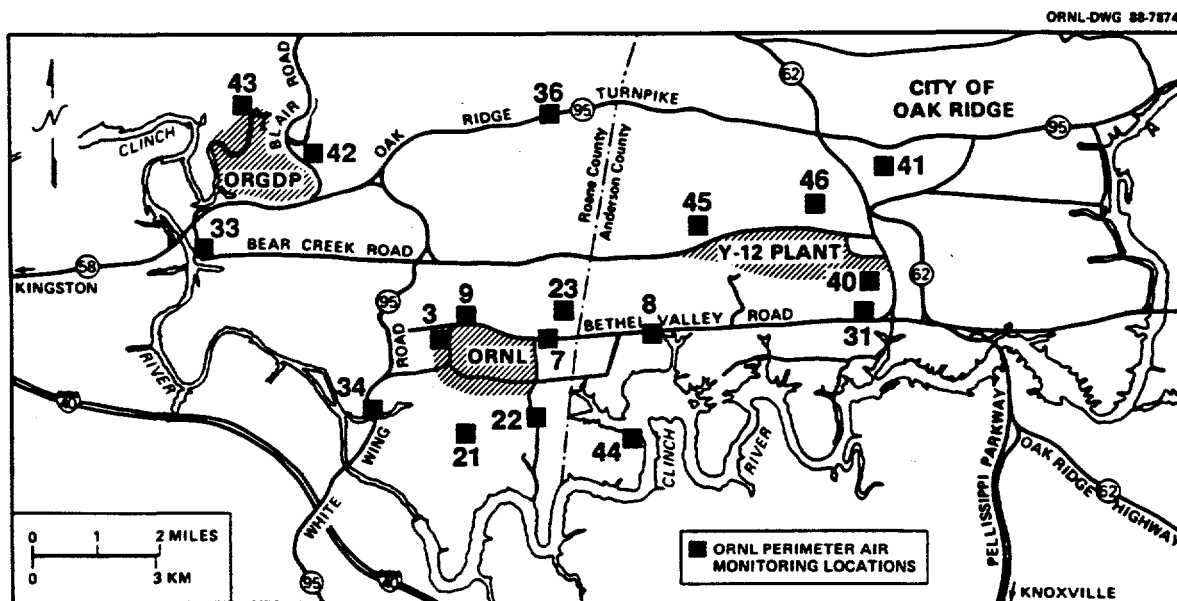


Fig. 8. ORR and ORNL perimeter monitoring locations.

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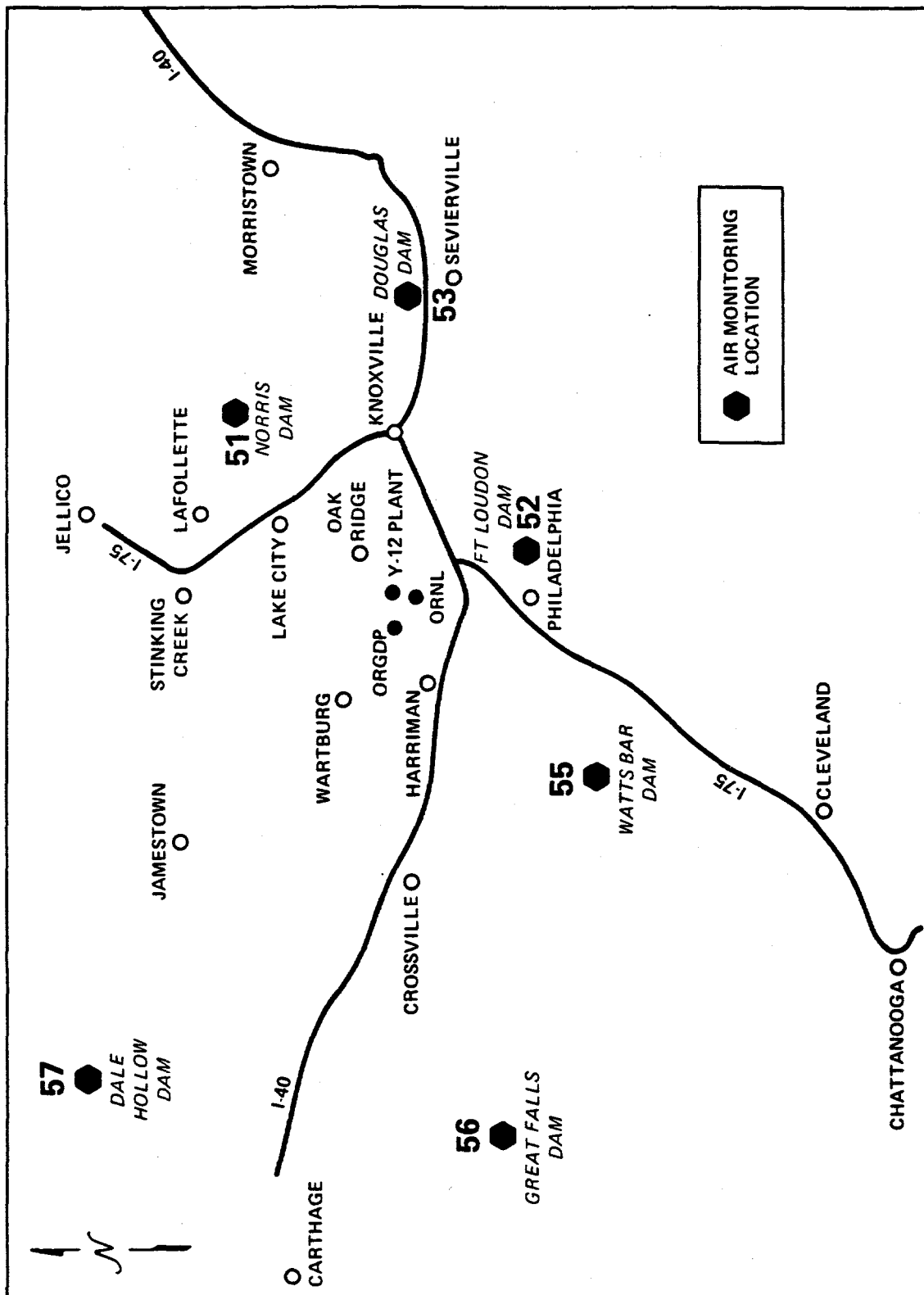


Fig. 9. Remote air monitoring locations.

Table 7. ORNL surface and tap water samples

Location (Figure) ^a	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
190 ponds (Figs. 10 and 11)	Flow proportional	Weekly	Monthly	Gamma scan, gross alpha, gross beta
1500 area, 3518 (Figs. 10 and 11)	Flow proportional	Weekly	Monthly	Gross alpha, gross beta
2000 area, sewage treatment plant (Figs. 10 and 11)	Flow proportional	Weekly	Monthly	Gamma scan, gross beta, Sr ^b
3544 (Figs. 10 and 11)	Flow proportional	Weekly	Monthly	Gross alpha, gross beta, gamma scan, Sr ^b
7500 bridge (Figs. 10 and 11)	Time proportional	Daily	Daily	Gamma scan, Sr ^b
7500 bridge, MB1, MB2, White Oak Creek (Figs. 10 and 11)	Flow proportional	Weekly	Monthly	Gamma scan, Sr ^b , ³ H
First Creek, Fifth Creek, Raccoon Creek, Northwest tributary (Figs. 10 and 11)	Grab	Weekly	Monthly	Gamma scan, Sr ^b
Gallaher, Kingston (Fig. 12)	Grab	Weekly	Quarterly	³ H, ⁶⁰ Co, ¹³⁷ Cs, gamma scan, gross alpha, gross beta, Pu, Sr ^b , U
HFIR ponds (Figs. 11 and 12)	Flow proportional	After discharge	Monthly	Gamma scan, gross alpha, gross beta
Melton Hill Dam (Figs. 11 and 12)	Flow proportional	Weekly	Quarterly	²⁴¹ Am, ²⁴⁴ Cm, ⁶⁰ Co, ¹³⁷ Cs, gross alpha, Pu, Th, U, Sr ^b , ³ H
Northwest tributary (Figs. 11 and 12)	Flow proportional	Weekly	Monthly	Gamma scan, Sr ^b
ORNL tap (Figs. 11 and 12)	Grab	Daily	Quarterly	⁶⁰ Co, ¹³⁷ Cs, gross alpha, gross beta, Pu, Sr ^b , U
White Oak Creek headwaters (Figs. 11 and 12)	Grab	Weekly	Monthly	²⁴¹ Am, ²⁴⁴ Cm, ⁶⁰ Co, ¹³⁷ Cs, gross alpha, Sr ^b , ³ H, Pu, Th, U
White Oak Dam (Figs. 11 and 12)	Flow proportional	Weekly	Weekly	²⁴¹ Am, ²⁴⁴ Cm, ⁶⁰ Co, ¹³⁷ Cs, gross beta, Pu, Sr ^b , ³ H
Transuranics ponds (Figs. 11 and 12)	Flow proportional	After discharge	Monthly	Gross beta

^aAlthough, as shown in Fig. 11, many of these locations are NPDES monitoring points, this table concerns only parameters not regulated under the NPDES permit.

^bTotal radioactive Sr (⁸⁹Sr + ⁹⁰Sr).

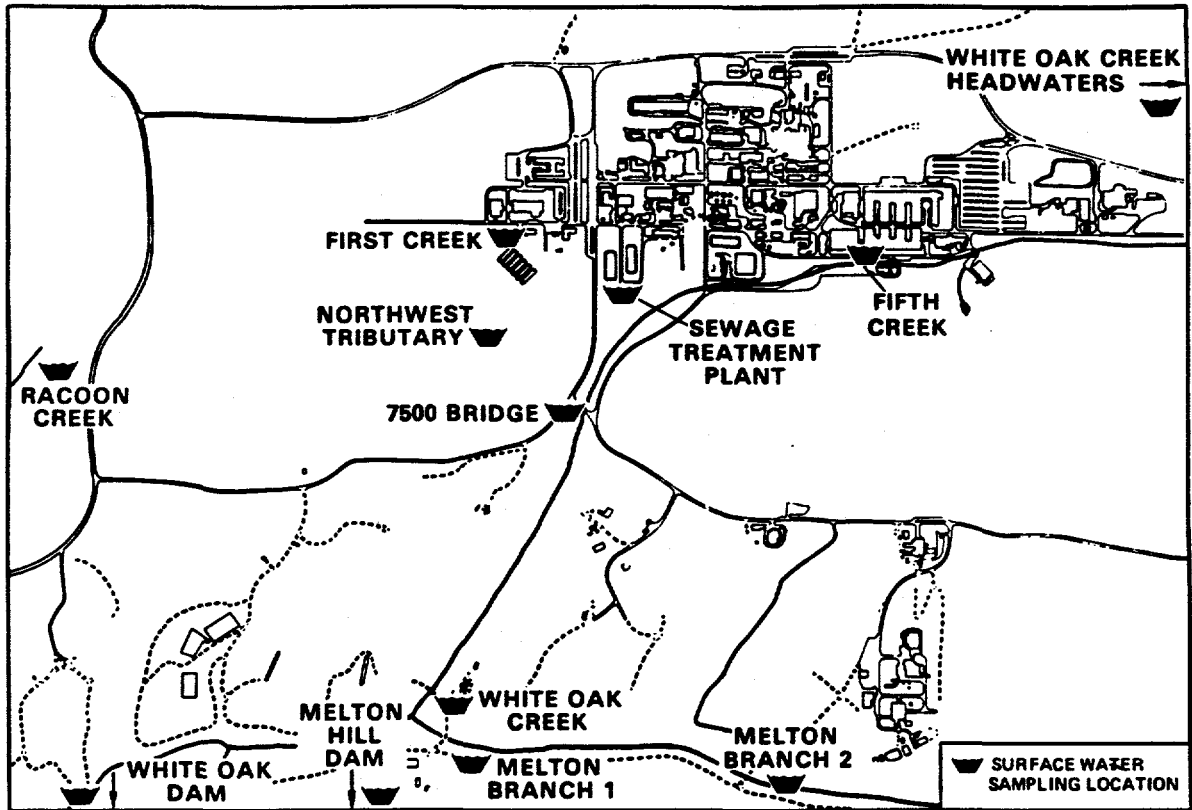


Fig. 10. ORNL water sampling locations.

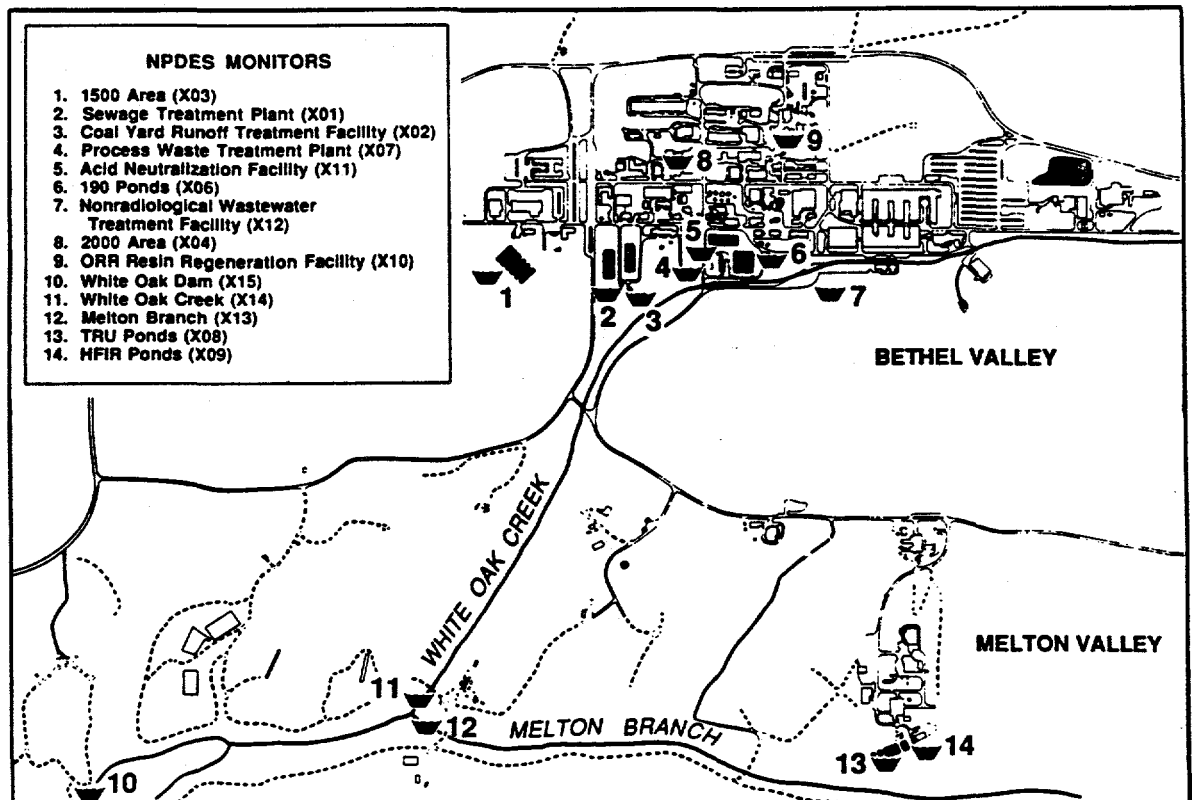


Fig. 11. ORNL NPDES monitoring locations.

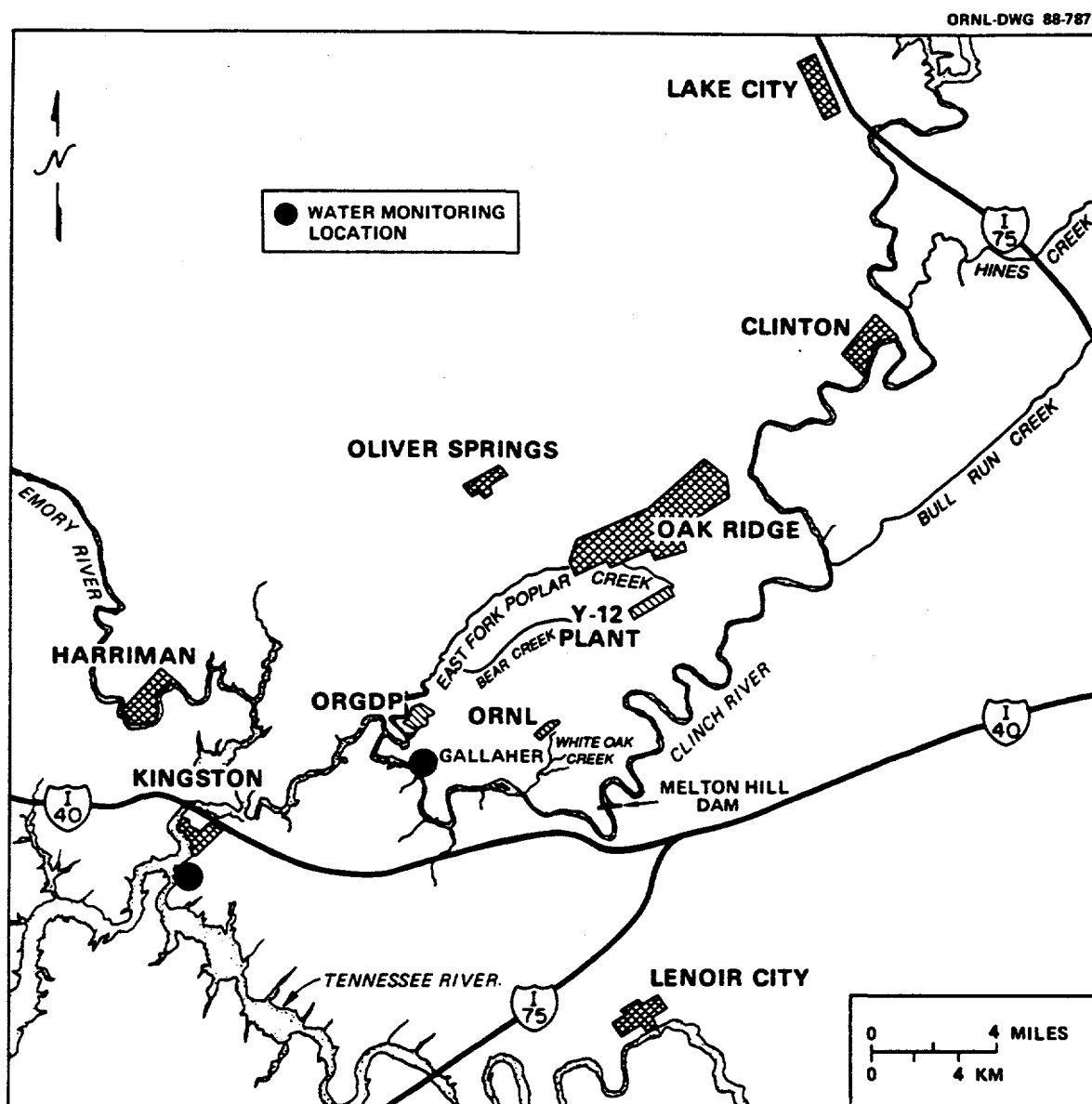


Fig. 12. Kingston and Gallaher water sampling locations.

Table 8. ORNL off-site groundwater (culinary) monitoring^a

Location	Sampling type	Collection frequency	Parameters analyzed
Approximately 20 residences west of DOE-ORO facilities and within 1 mile of the Clinch River/Watts Bar Dam water system ^b	Grab	Semiannually in 1988, annually thereafter	Alpha, beta, gamma, nitrates, total U, Hg, pH, temperature, conductivity, dissolved O

^aThis monitoring program is being developed to determine the quality of water, for culinary purposes, surrounding the DOE-ORO Reservation and to determine if a potential exposure from this pathway exists.

^bAll sampling sites will be at the point local property owners draw water from the aquifer for drinking purposes, and before final filtration.

Table 9. ORNL external gamma radiation measurements

Location (Figure)	Sampling type	Collection frequency	Analysis frequency
3, 7, 9, 21, 22 (Fig. 13)	Continuous	Quarterly	Quarterly
31, 33, 34, 36, 40-45 (Fig. 13)	Continuous	Continuous	10-min
8, 23 (Fig. 13)	Continuous	Quarterly	Quarterly
41, 42, 60, 61, 64-69 (Fig. 14)	Continuous	Quarterly	Quarterly
51, 52, 53, 55-57 (Fig. 15)	Continuous	Semiannually	Semiannually

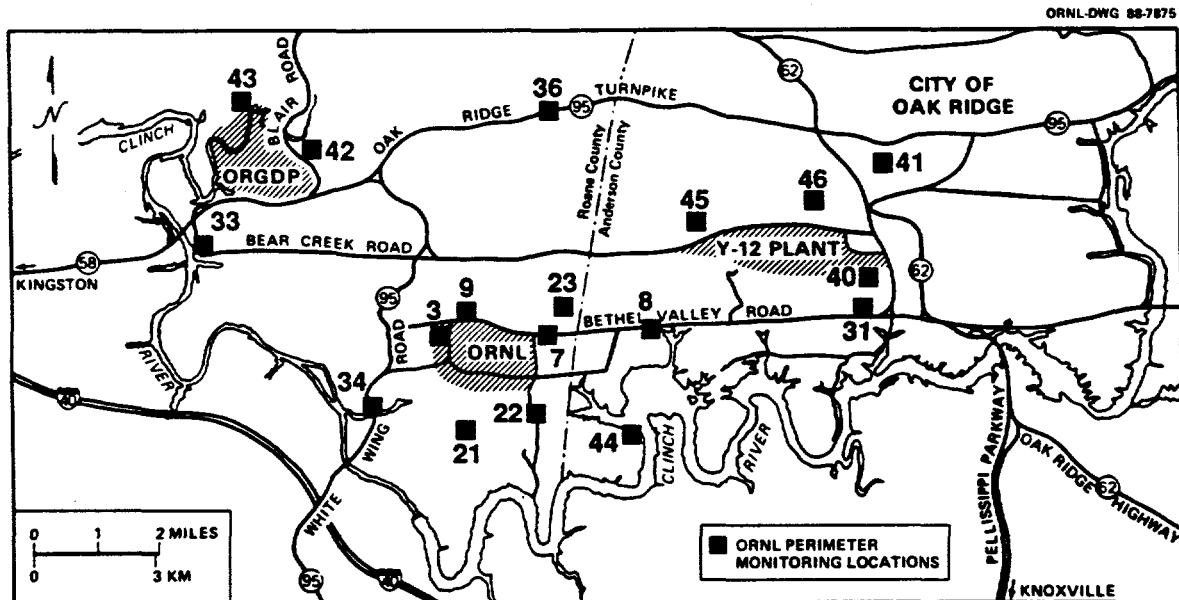


Fig. 13. ORNL perimeter and ORR grass and soil monitoring locations.

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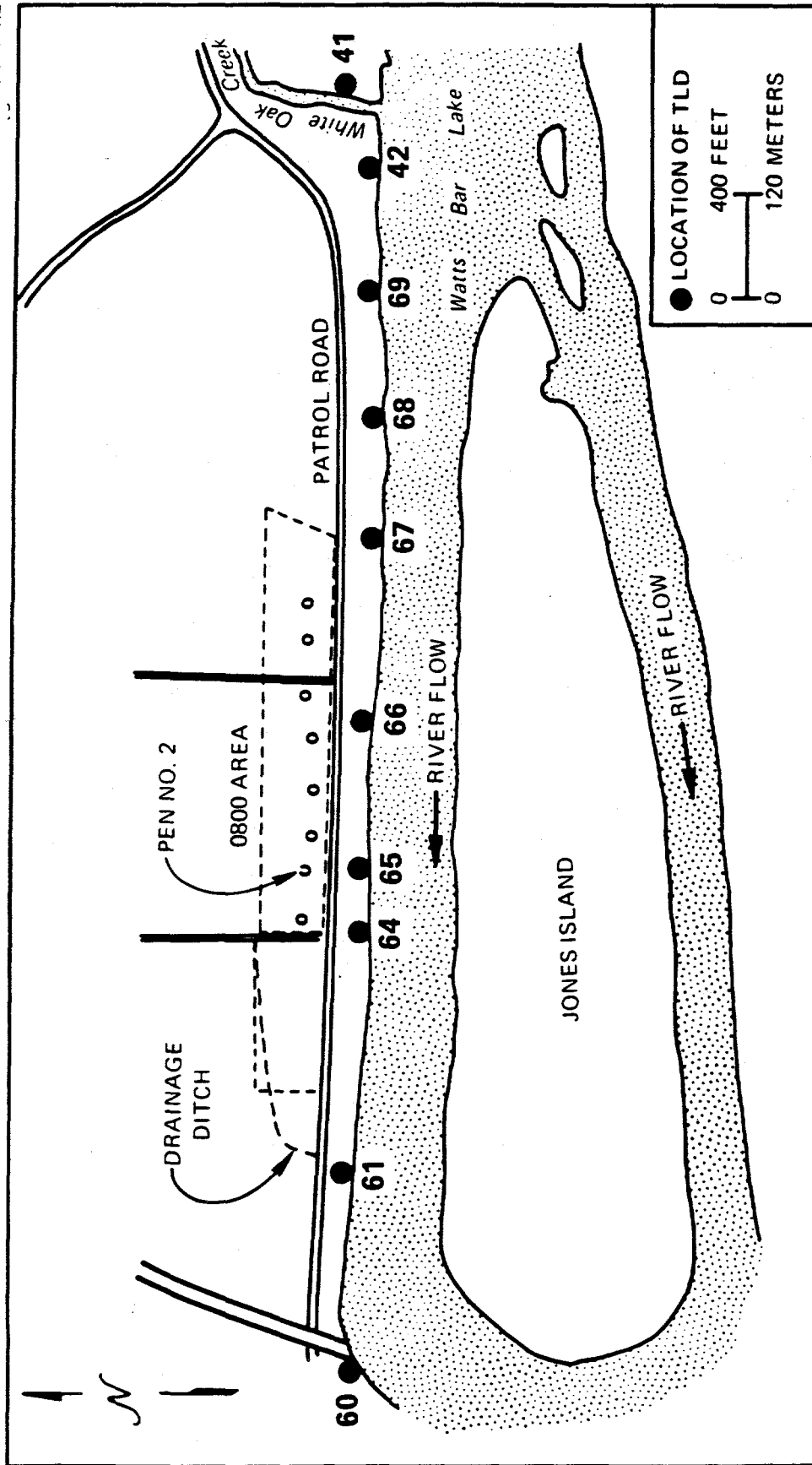


Fig. 14. TLD locations along the Clinch River.

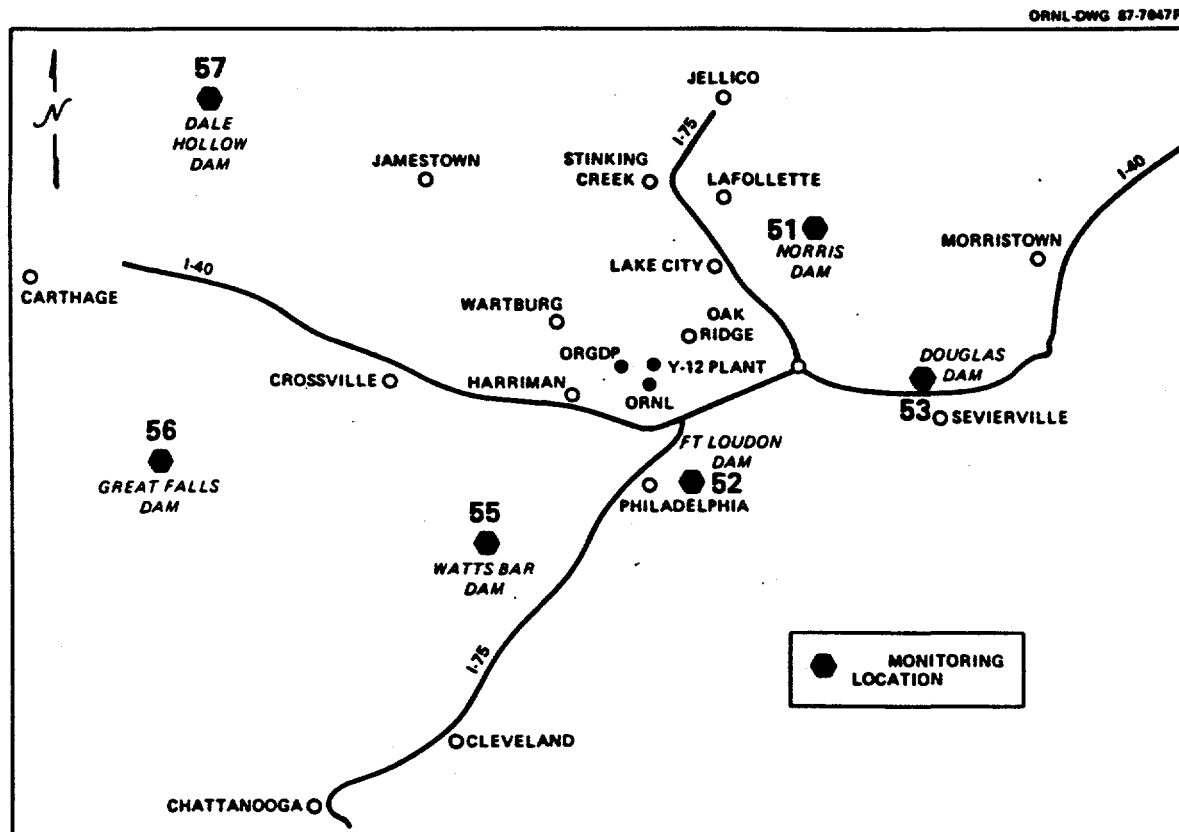


Fig. 15. ORNL remote grass and soil monitoring locations.

Table 10. ORNL milk, fish, soil, and grass monitoring

Location (Figure)	Sampling type	Collection frequency	Analysis frequency	Parameters analyzed
<i>Milk</i>				
2, 3, 4, 6, 7, 8 (Fig. 16)	Grab	Biweekly	Biweekly	^{131}I , Sr^a
51, 53, 56 (Fig. 16)	Grab	Semiannually	Semiannually	^{131}I , Sr^a
<i>Fish</i>				
CRK 8.0, CRK 33.0, CRK 40.0 (Fig. 17)	Grab	Twice per year	Twice per year	Gamma scan, Sr^a , Hg, PCBs
<i>Soil and grass</i>				
3, 7, 8, 9 (Fig. 13)	Grab	Annually	Annually	Gamma scan, Sr^a , ^{238}Pu , ^{239}Pu , ^{234}U , ^{235}U , ^{238}U
23, 31, 34, 36, 40-46 (Fig. 13)	Grab	Annually	Annually	Gamma scan, Sr^a , ^{238}Pu , ^{239}Pu , ^{234}U , ^{235}U , ^{238}U
51-53, 55-57 (Fig. 15)	Grab	Annually	Annually	Gamma scan, Sr^a , ^{238}Pu , ^{239}Pu , ^{234}U , ^{235}U , ^{238}U

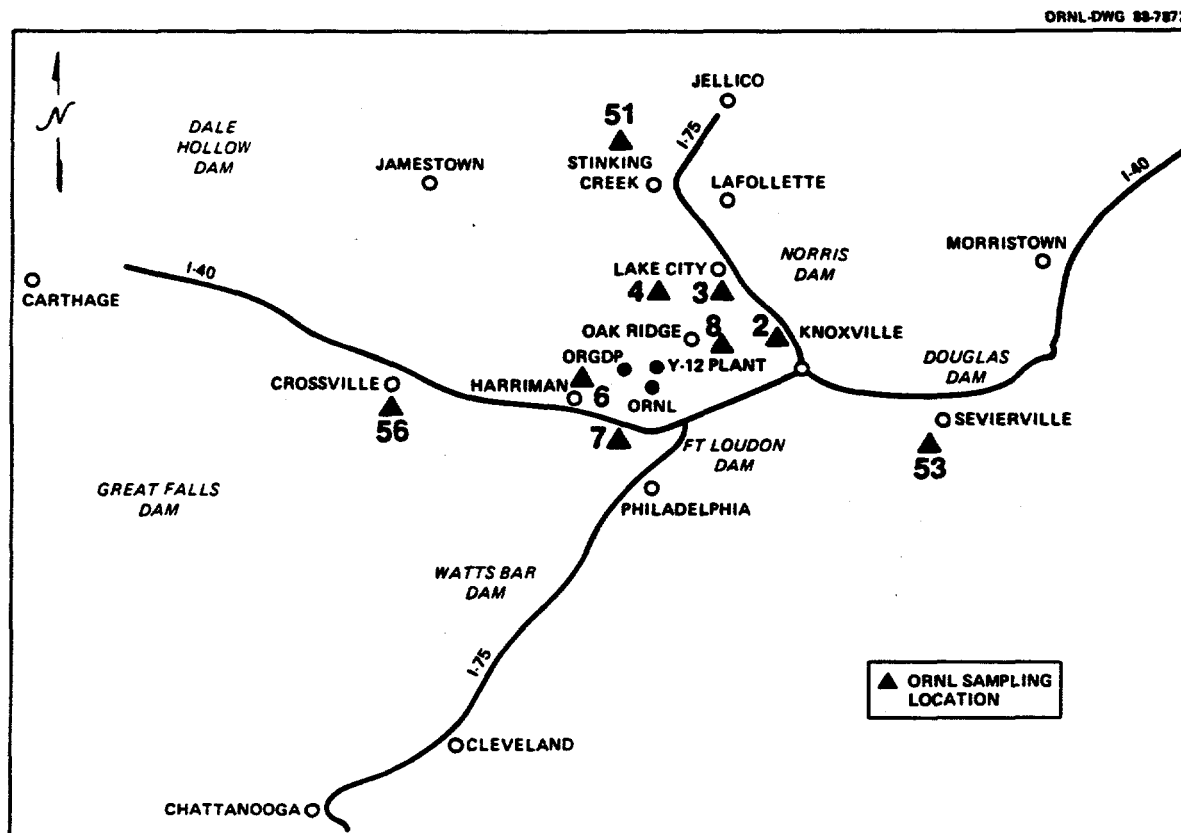
^aTotal radioactive Sr (^{89}Sr + ^{90}Sr).

Fig. 16. Map showing milk sampling stations.

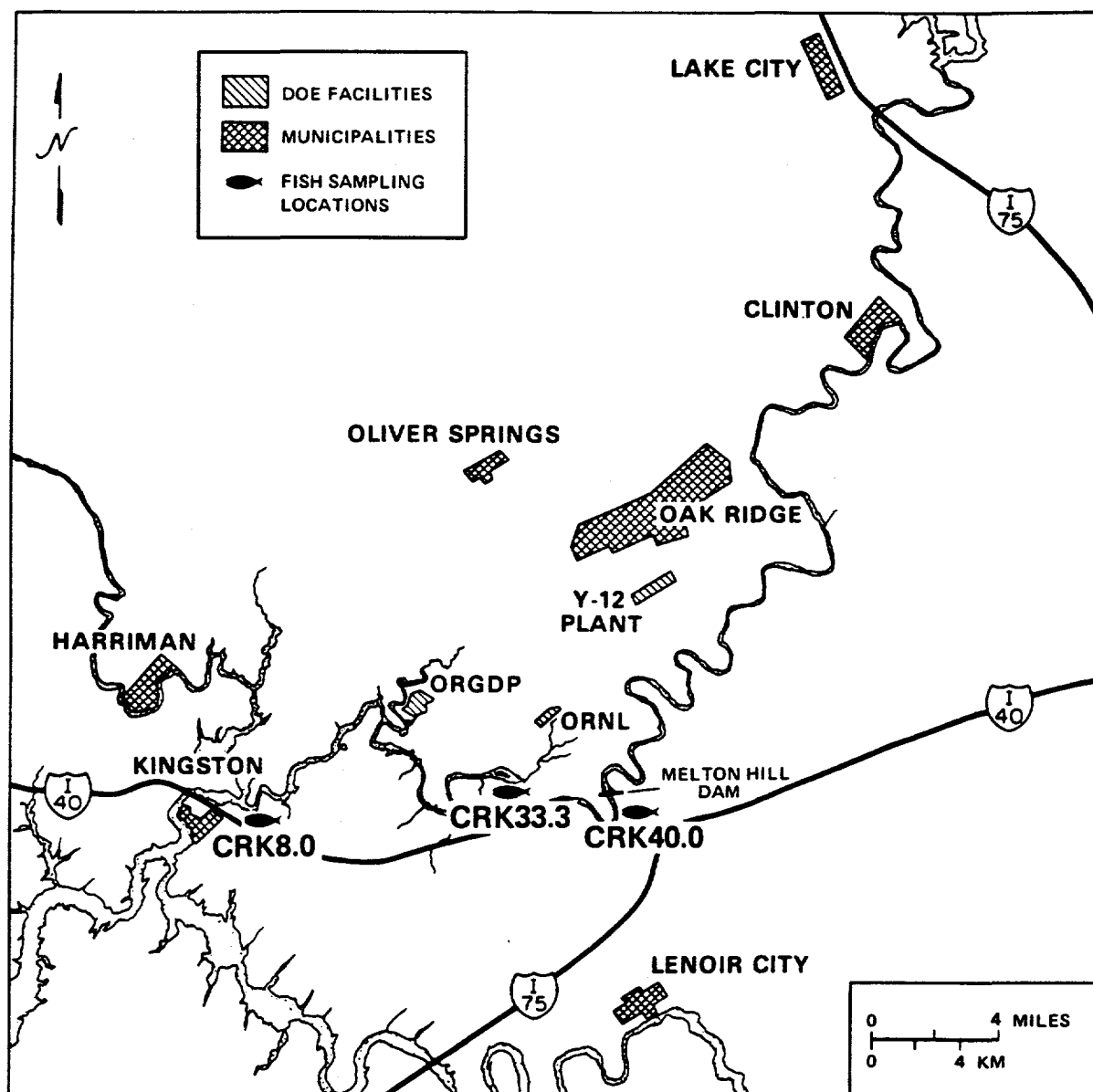


Fig. 17. Fish sampling locations along the Clinch River.

Table 11. Environmental monitoring at PORTS

Location (Figure)	Sampling type	Collection frequency	Parameters monitored
<i>Ambient air</i>			
A3, A6, A8, A12, A15, A23, A24, A28, A29, A37 (Fig. 18)	Continuous	Weekly/monthly	Fluoride, alpha, beta
A10, A35, A36, A38, A39, A40 (Fig. 19)	Continuous	Weekly/monthly	Fluoride, alpha, beta
Meteorological tower (10-m and 40-m) (Fig. 19)	Continuous	Weekly/monthly	Temperature, dew point, wind speed and direction, solar radiation, barometric pressure, precipitation, soil temperature
<i>Ambient surface water</i>			
RW1 (Fig. 20)	Grab	Weekly/quarterly	U, alpha, beta, Tc, fluorides, spectrographic scan
RW2, RW3, RW5 (Fig. 20)	Grab	Semiannually	U, alpha, beta, Tc
RW6, RW7, RW8, RW12, RW13, RW33 (Fig. 20)	Grab	Weekly/quarterly	U, alpha, beta, Tc, fluorides, spectrographic scan
<i>External gamma</i>			
32 locations (Figs. 21 and 22)	Continuous	Quarterly	Gamma
<i>Stream sediment</i>			
11 locations (Fig. 23)	Grab	Semiannually	U, alpha, beta, Tc
<i>Soil</i>			
27 locations (Figs. 24, 25, and 26)	Grab	Semiannually	U, alpha, beta, Tc
<i>Vegetation (grass)</i>			
27 locations (Figs. 24, 25, and 26)	Grab	Semiannually	U, alpha, beta, Tc, fluoride
<i>Fish</i>			
4 locations (Scioto River and local creeks)	Grab	Annually	U, alpha, beta, Tc, PCB, Hg, fluoride, Cr
<i>Resident produce</i>			
Various locations	Grab	Annually	U, alpha, beta, Tc
<i>Resident water</i>			
9 locations	Grab	Semiannually	U, alpha, beta, Tc, volatile organic halogens

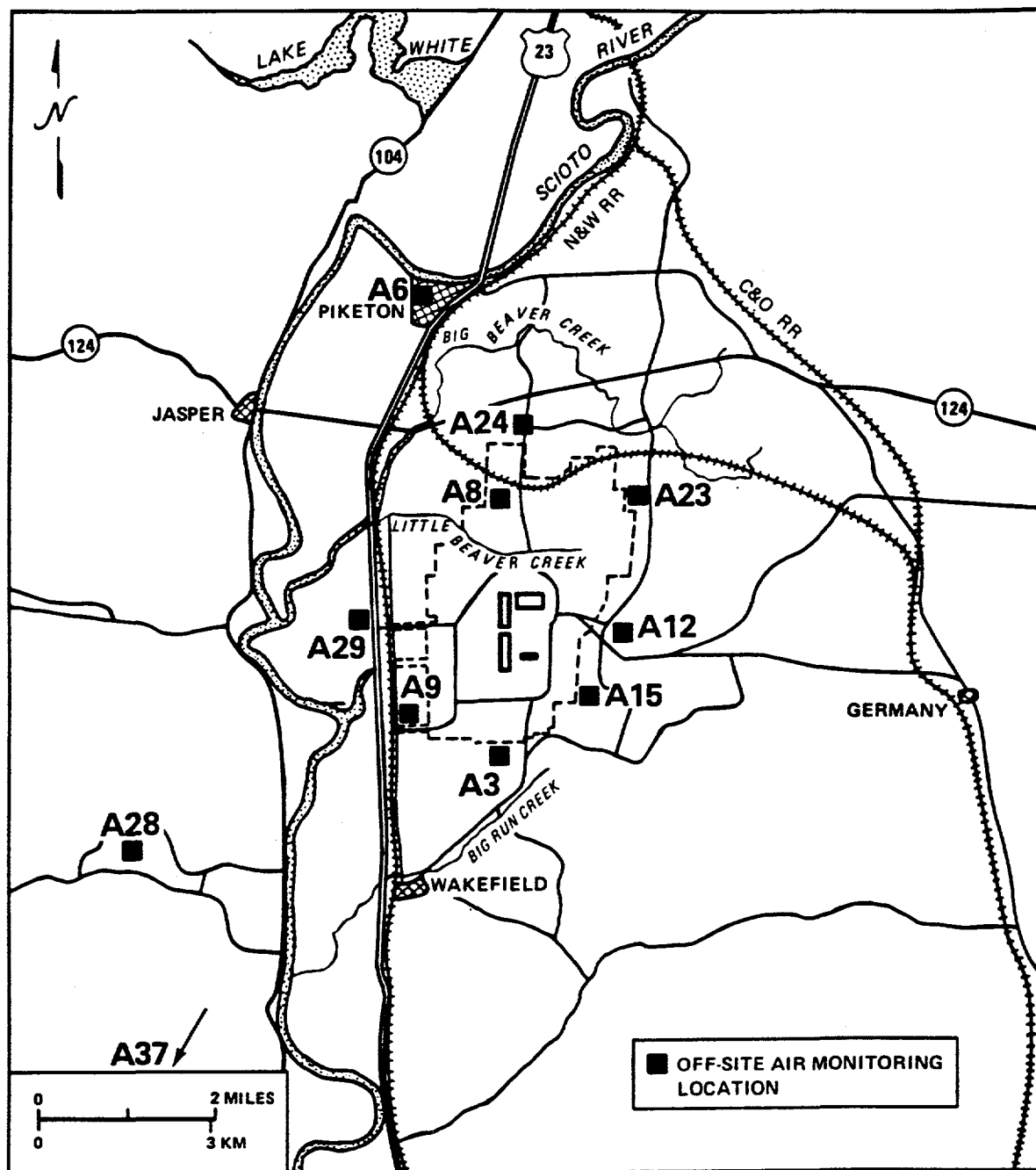


Fig. 18. Off-site air monitoring locations at PORTS.

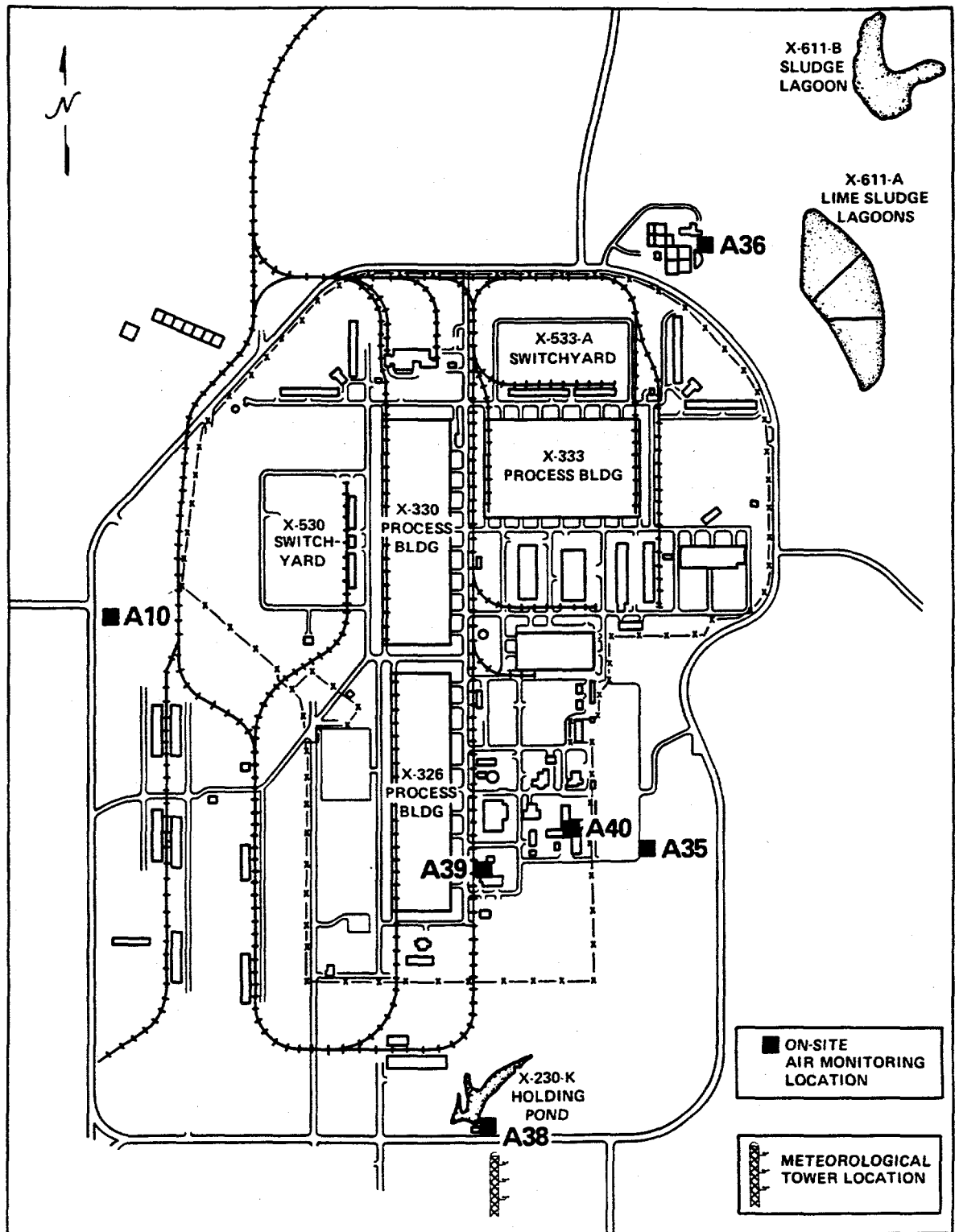


Fig. 19. PORTS on-site air monitoring locations and meteorological tower.

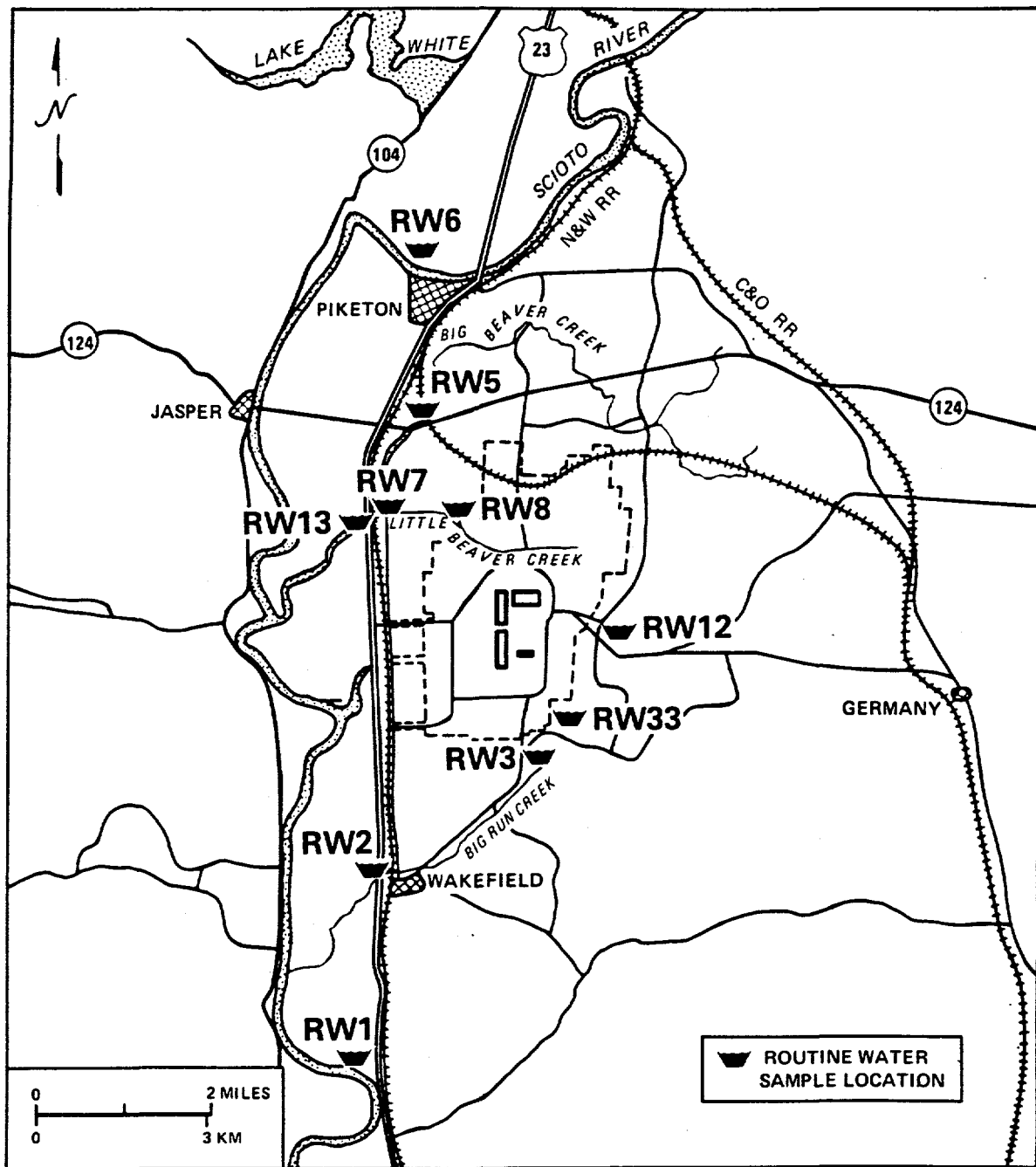


Fig. 20. Surface water sampling stations at PORTS.



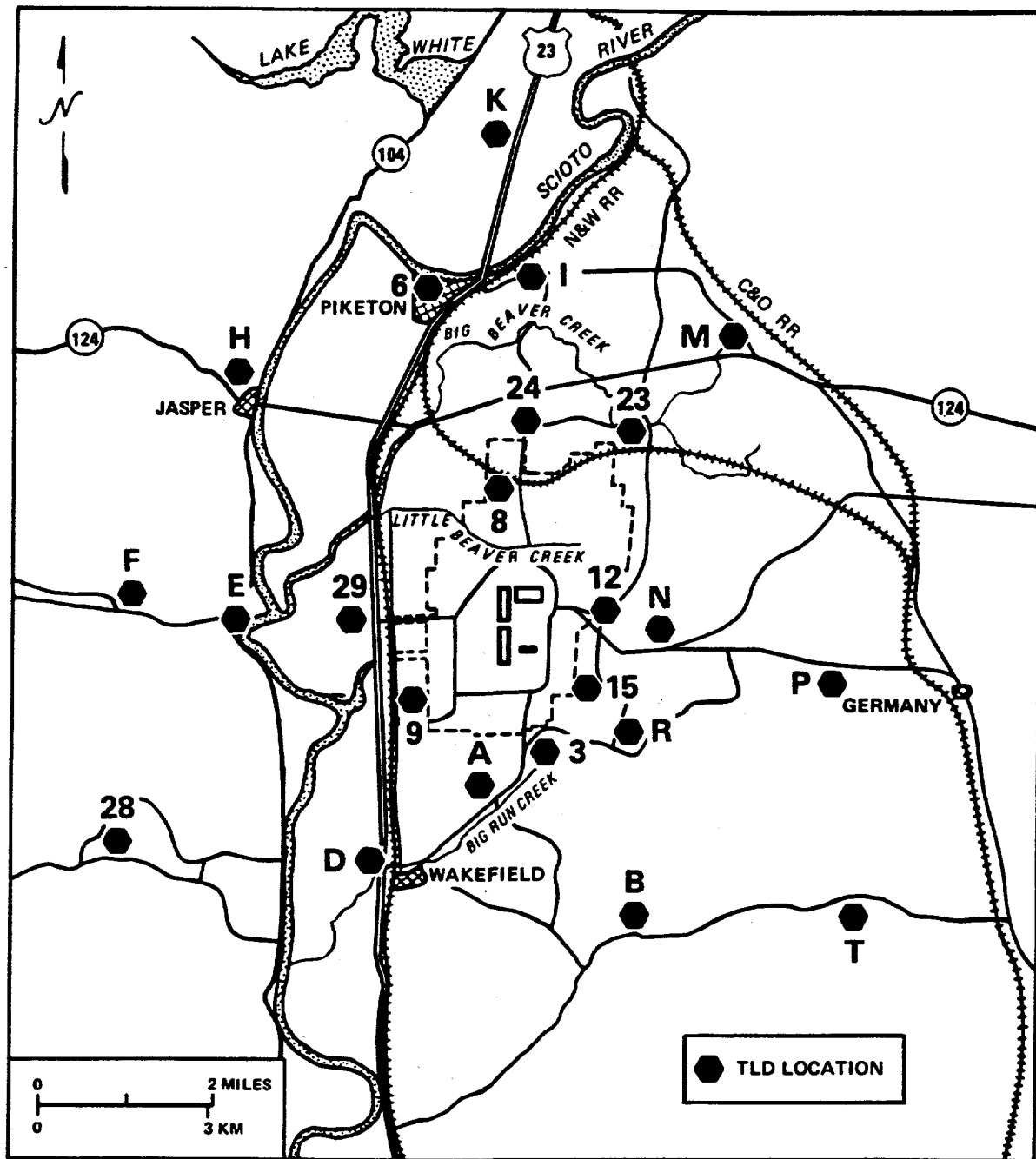


Fig. 22. Off-site TLD locations at PORTS.

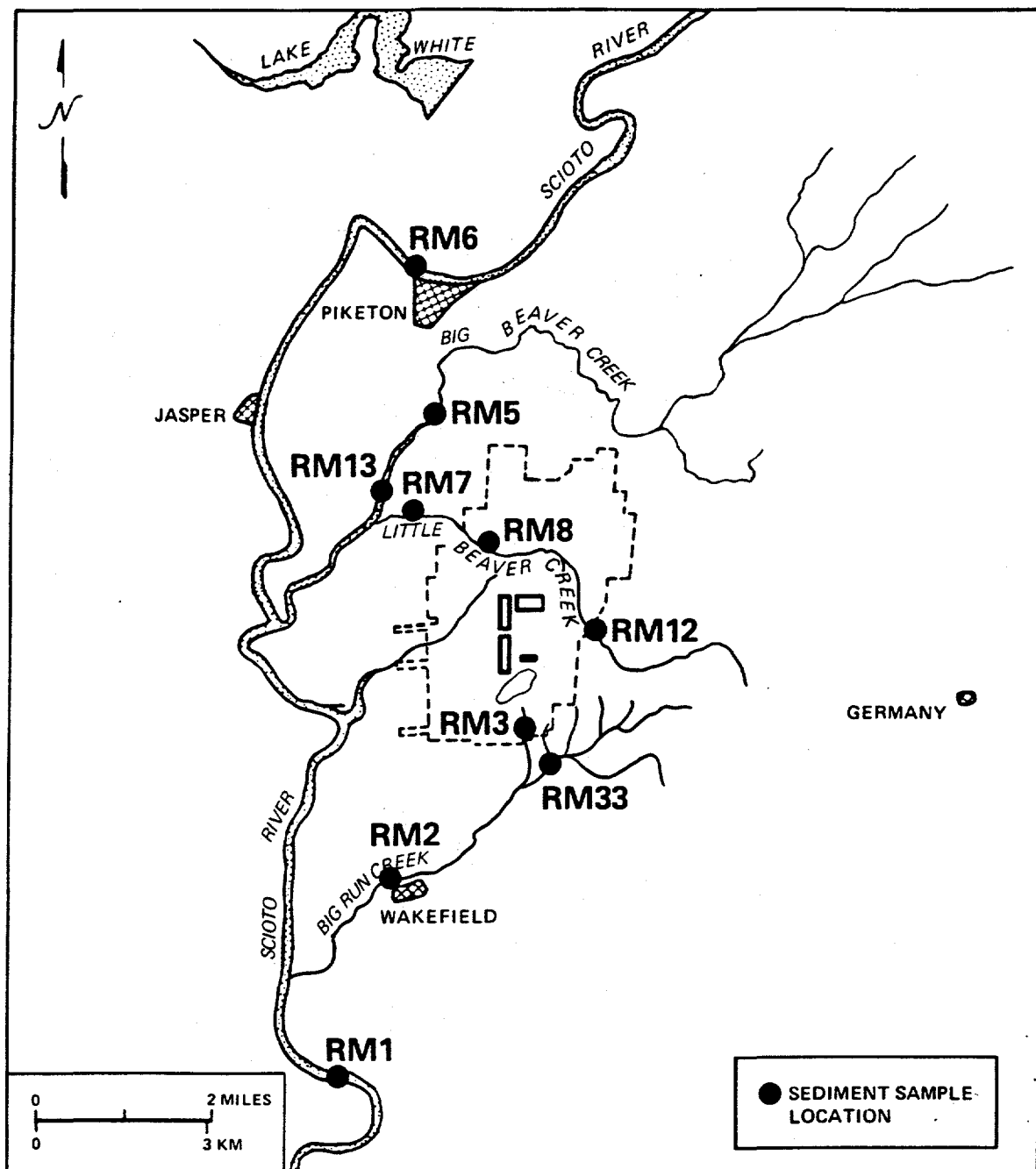


Fig. 23. Stream sediment sampling locations at PORTS.

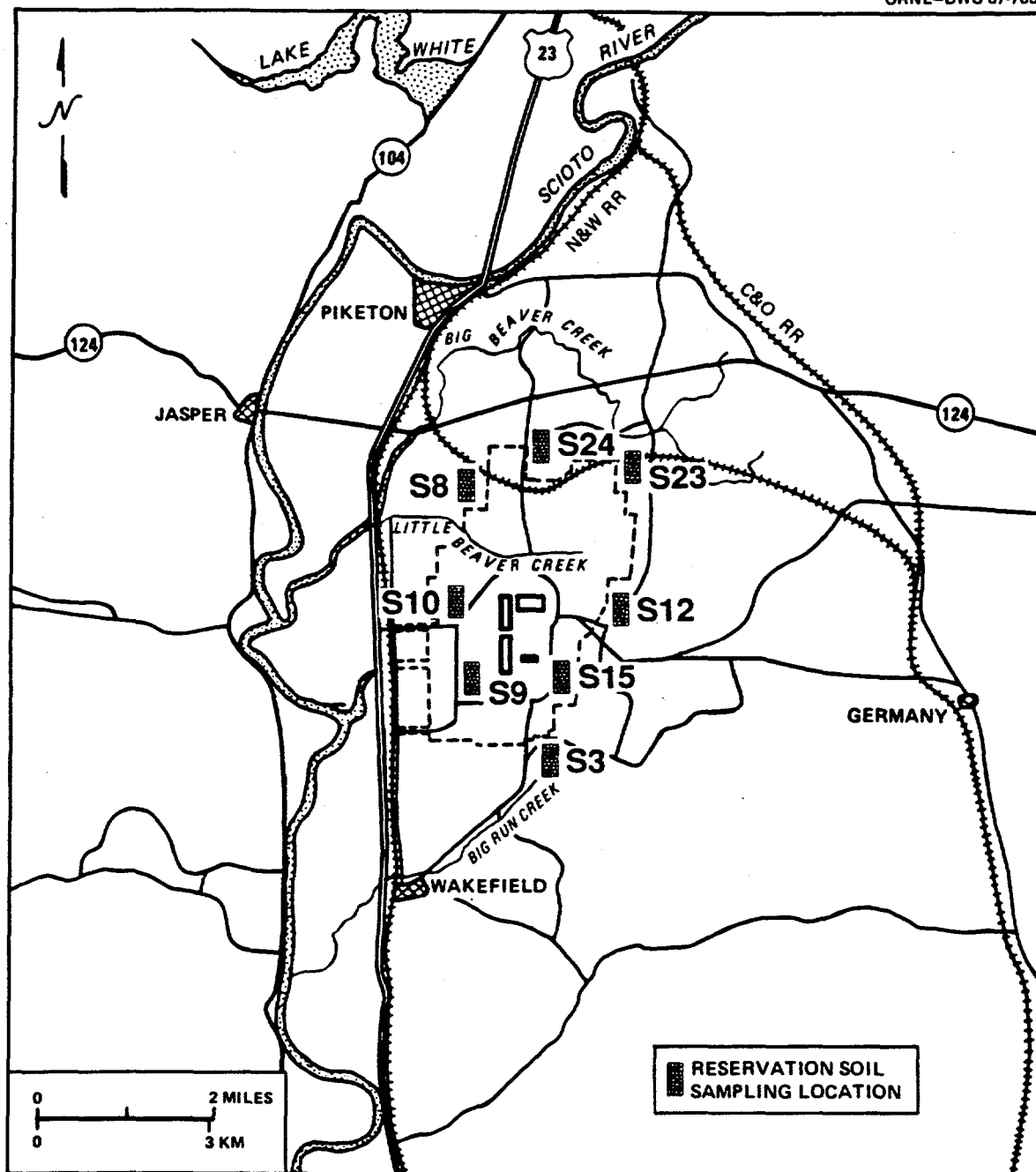


Fig. 24. Reservation soil sampling locations at PORTS.

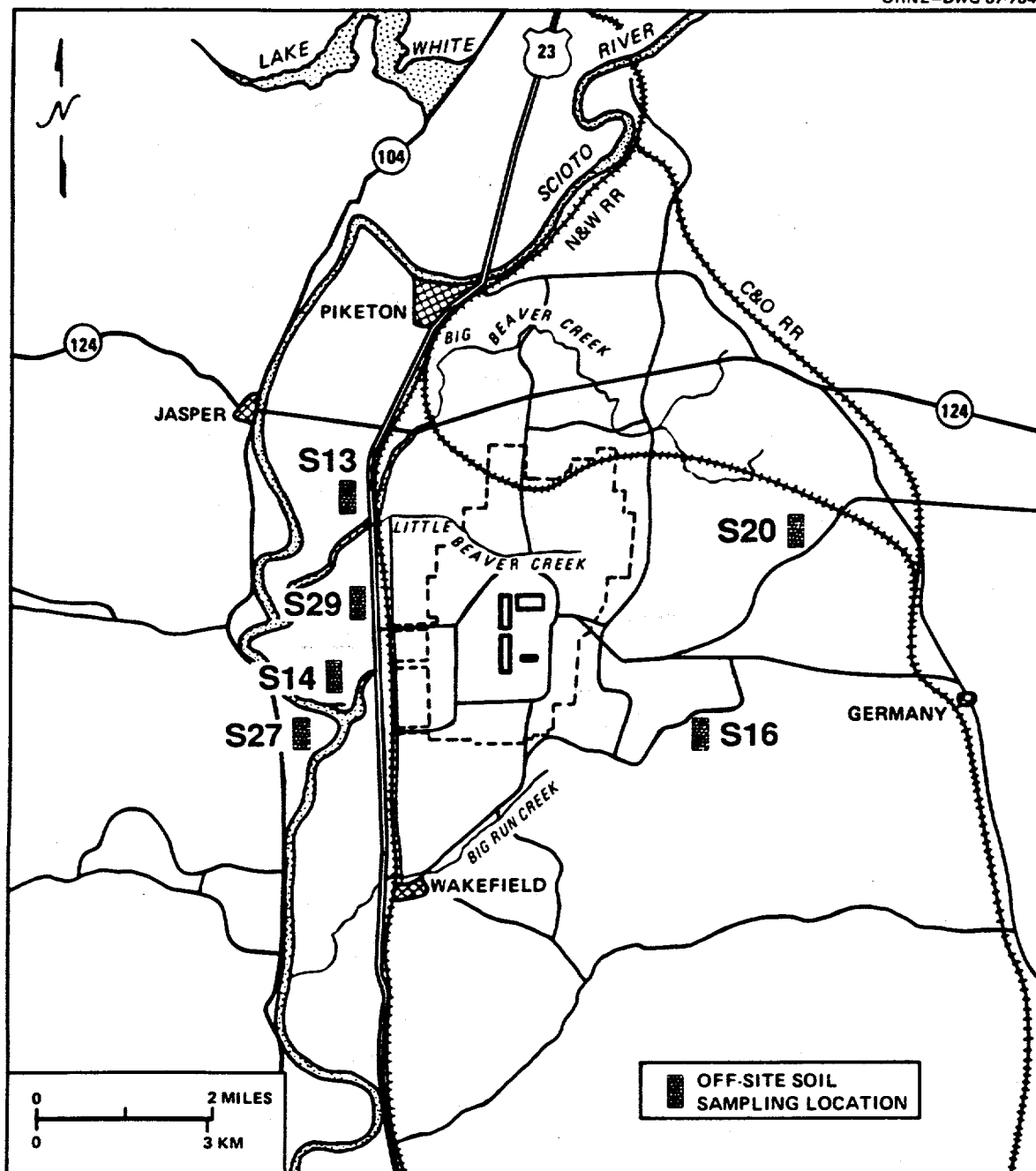


Fig. 25. Off-site soil sampling locations at PORTS.

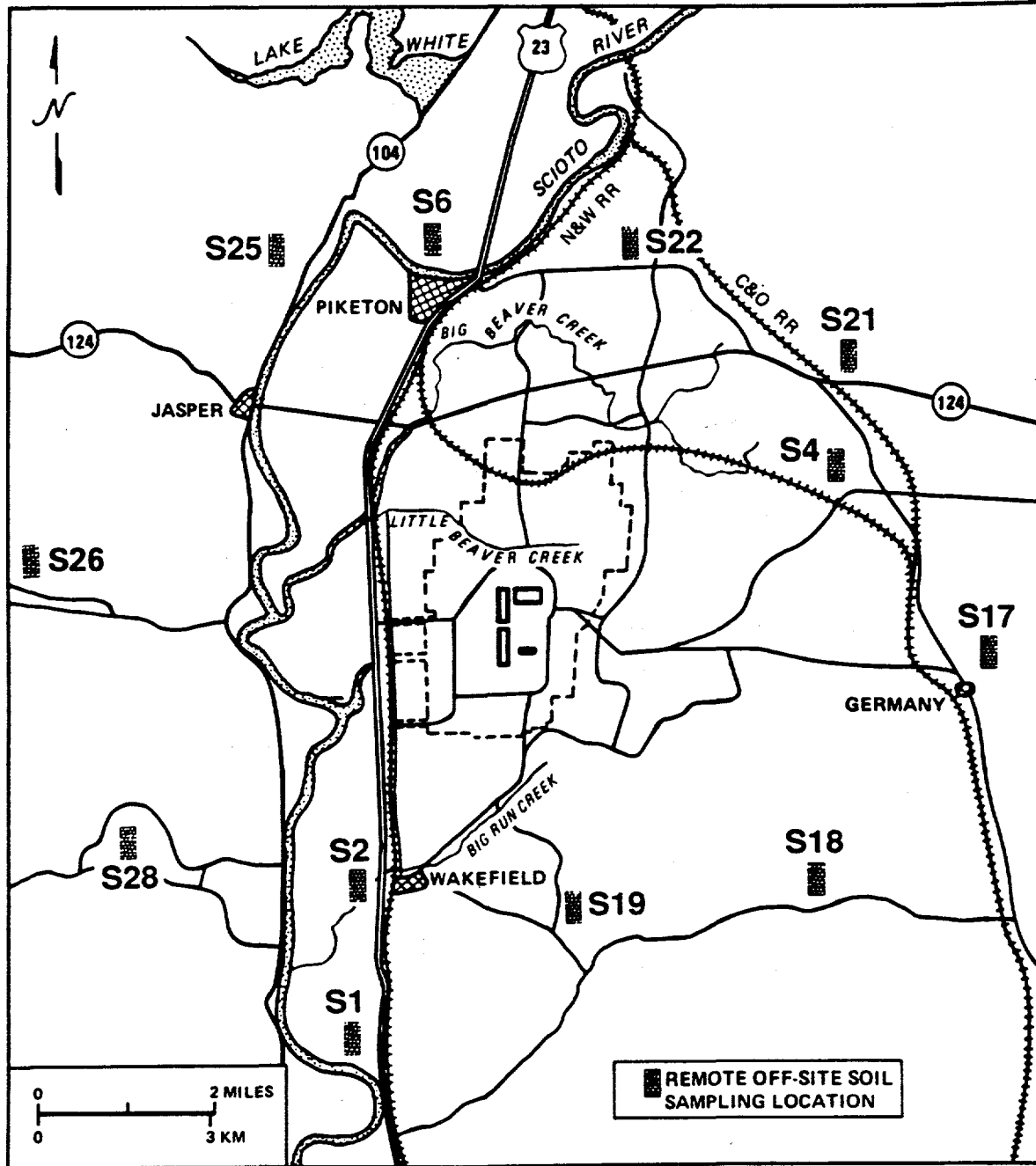


Fig. 26. Remote soil sampling locations at PORTS.

Table 12. Environmental monitoring at PGDP

Location (Figure)	Sampling type	Collection frequency	Parameters monitored
<i>Ambient air</i>			
12 locations (Fig. 27)	Composite	Weekly	U, alpha, beta, fluoride
<i>Meteorological tower</i>			
	Continuous (10-m and 60-m)	Continuous	Wind speed and direction, temperature
<i>Surface water</i>			
SW1, SW29 (Fig. 28)	Grab	Monthly	Nitrate, sulfate, phosphate, Cl, pH, U, fluoride, dissolved alpha and beta, suspended alpha and beta
SW30 (Fig. 28)	Grab	Monthly	Nitrate, sulfate, phosphate, Cl, pH, U, fluoride, dissolved alpha and beta, suspended alpha and beta, 1,2-dichloroethane
<i>Soils</i>			
10 locations (Fig. 29)	Grab	Annually	U, ^{235}U , ^{230}Th , ^{237}Np , ^{99}Tc , ^{137}Cs , ^{40}K , ^{239}Pu , spectrochemical (42 elements)
<i>Sediment</i>			
21 locations (Fig. 30)	Grab	Annually	U, ^{235}U , ^{99}Tc , ^{237}Np , ^{239}Pu , ^{137}Cs , ^{40}K , ^{230}Th , spectrochemical (42 elements)
<i>Grass</i>			
18 locations (Fig. 31)	Grab	Quarterly	Fluorides
<i>Wildlife</i>			
Varies	Road kills (rabbit, deer)	Random	^{234}U , ^{235}U , ^{236}U , ^{239}Pu , ^{99}Tc , ^{230}Th , ^{237}Np
<i>Fish</i>			
Varies	Grab	Random	^{234}U , ^{235}U , ^{236}U , ^{239}Pu , ^{99}Tc , ^{230}Th , ^{237}Np
<i>Fruit and vegetables</i>			
Varies	Grab	Annually	^{237}Np , ^{239}Pu , ^{99}Tc , ^{230}Th , ^{234}U , ^{235}U , ^{238}U
<i>External gamma</i>			
14 locations (Fig. 32)	Continuous	Annual	Gamma

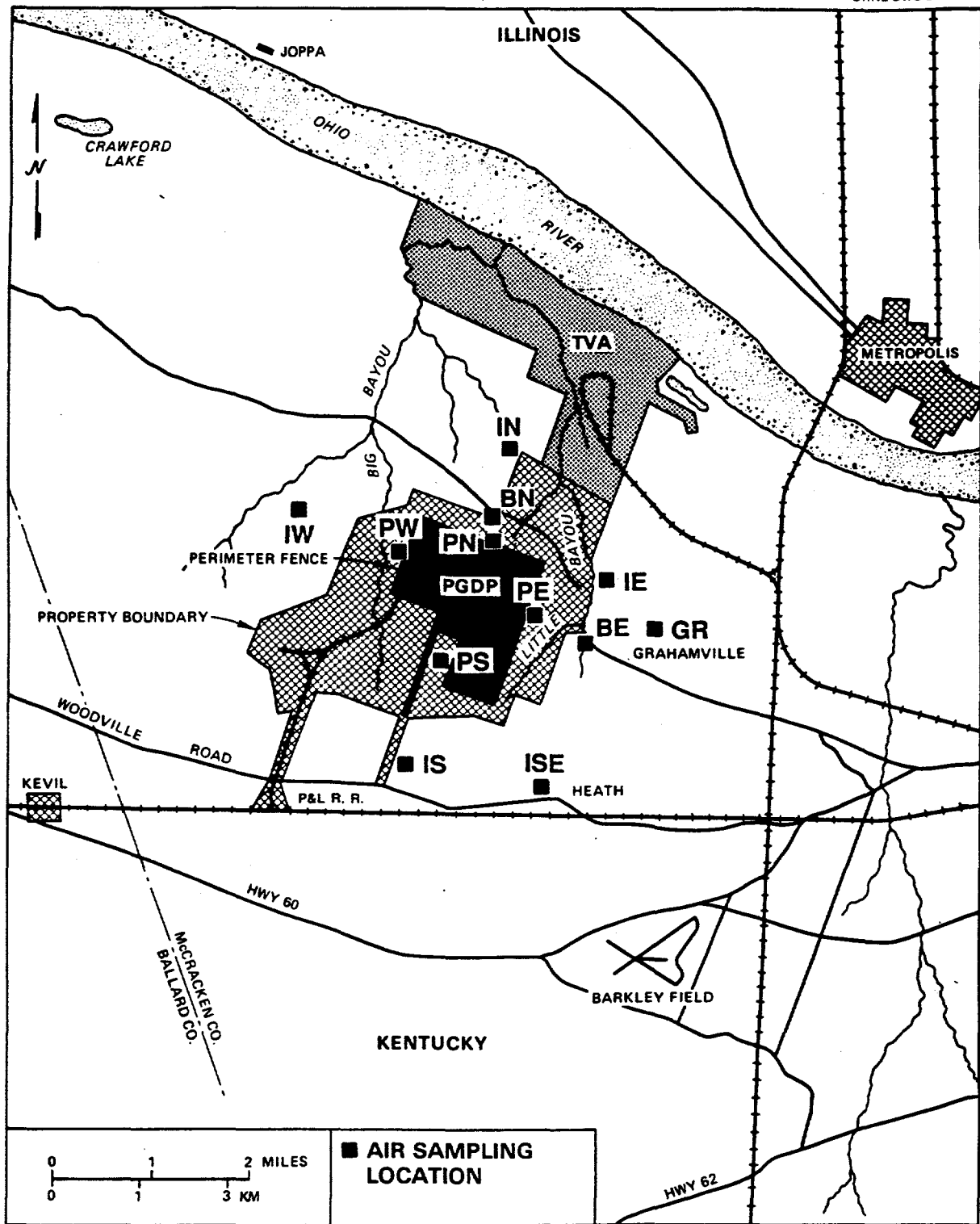


Fig. 27. Location of air sampling stations at PGDP.

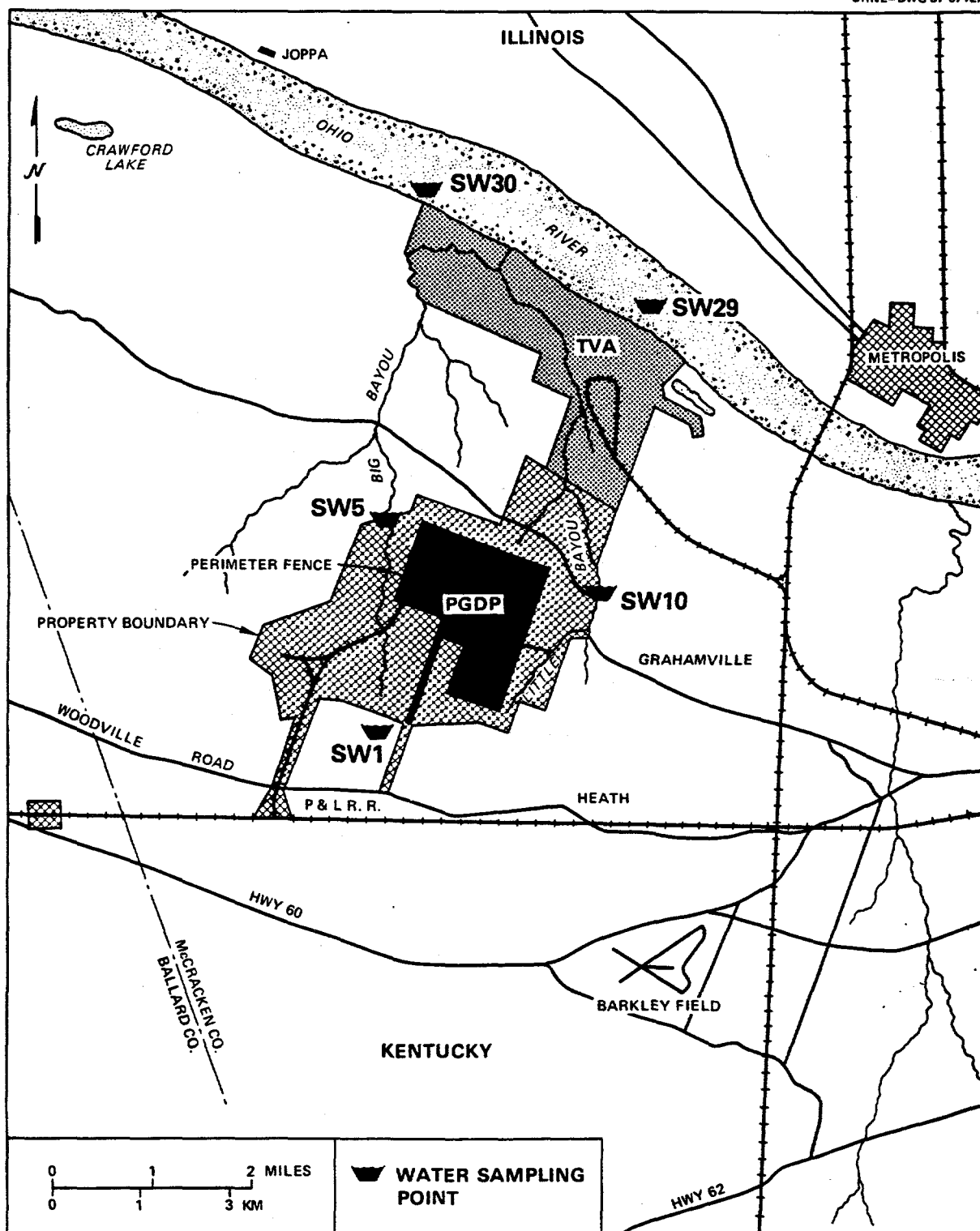


Fig. 28. Surface water characterization monitoring points at PGDP.

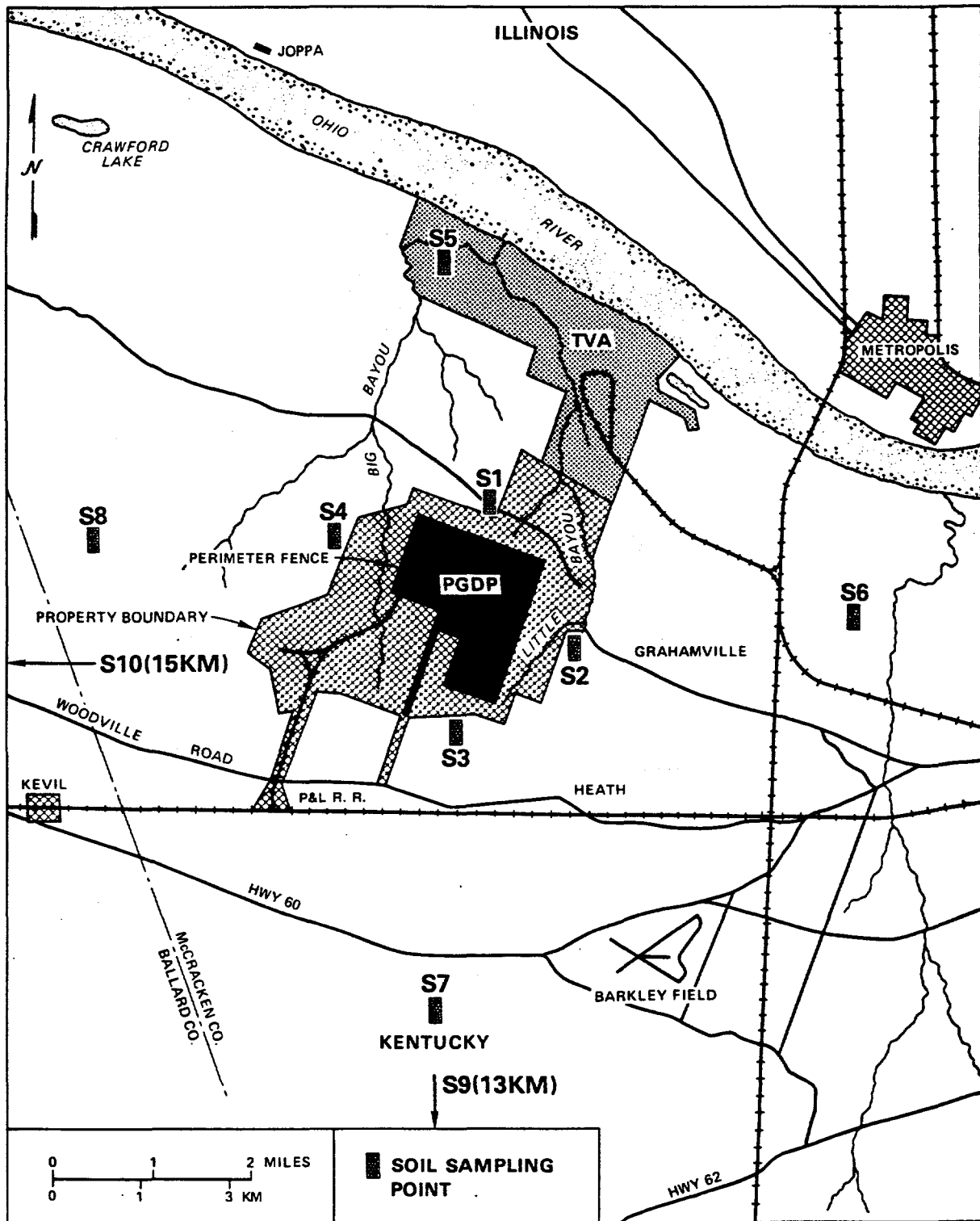


Fig. 29. PGDP soil sampling locations.

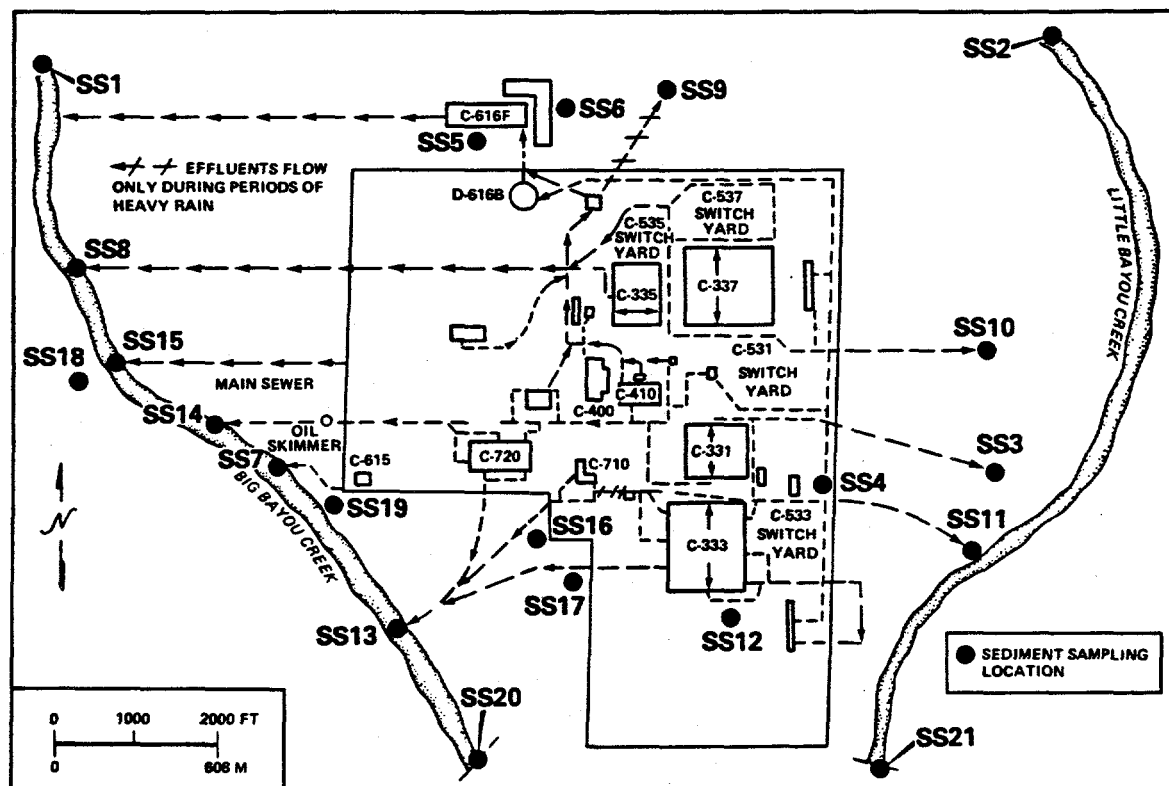


Fig. 30. PGDP sediment sampling locations.

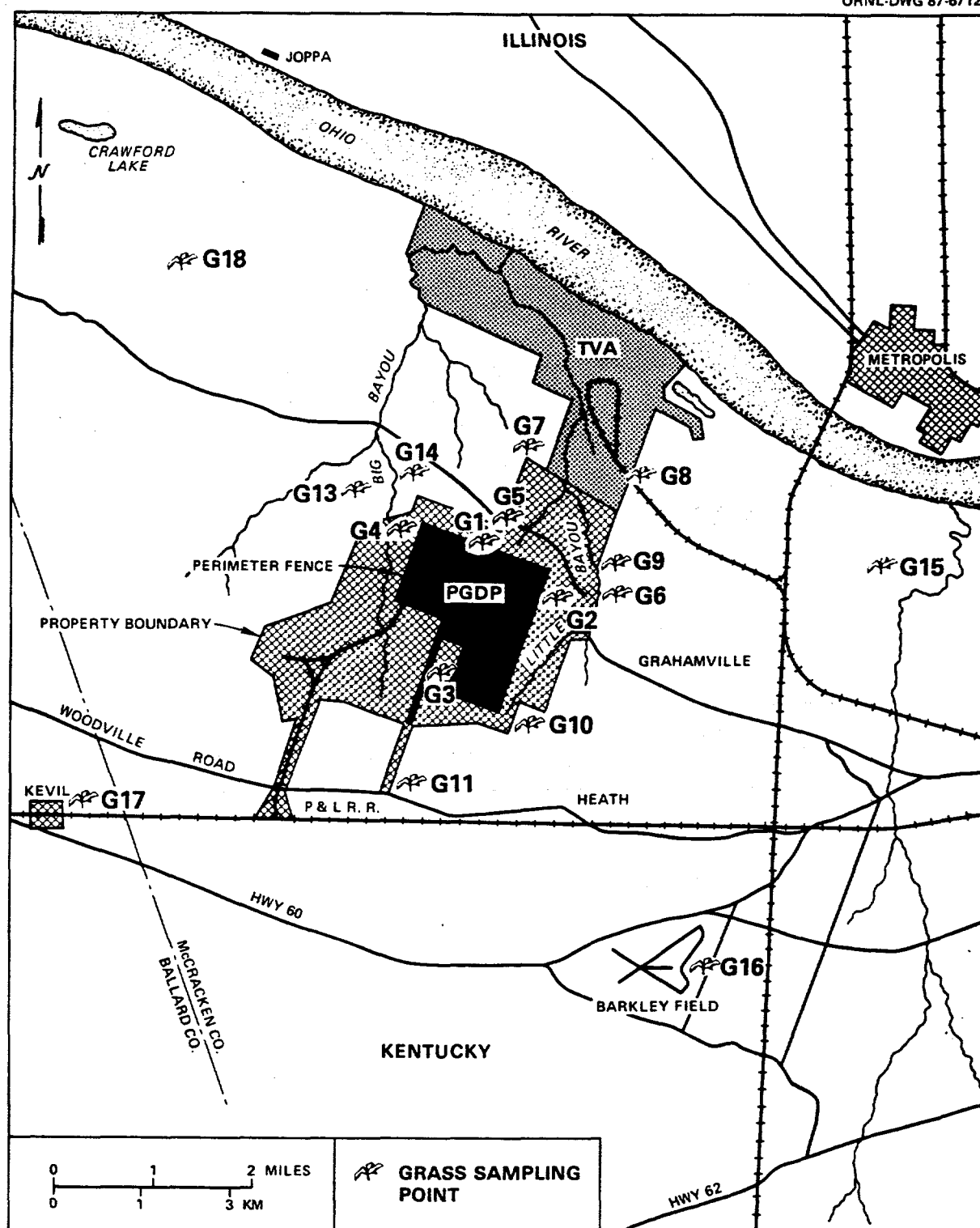


Fig. 31. Vegetation (grass) sampling locations at PGDP.

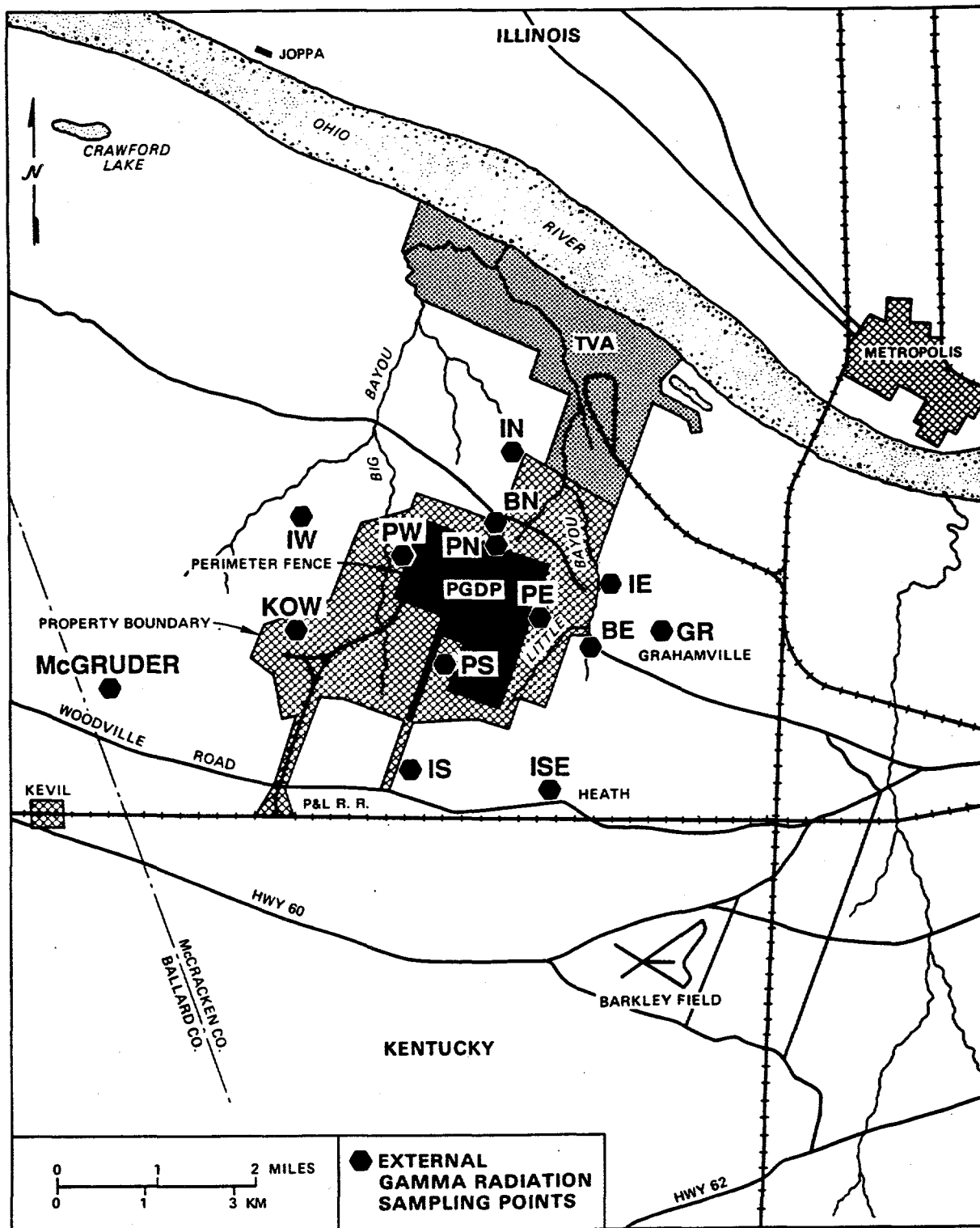


Fig. 32. TLD locations at PGDP.